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STRATEGIC ANALYSIS OF ORGANISATIONAL DECISION-MAKING AS THE INTERFACE BETWEEN CORPORATE IDIOSYNCRACIES AND THE ADOPTION OF TECHNOLOGICAL INNOVATIONS: THE CASE OF BUSINESS INFORMATION SYSTEMS

(In two volumes)

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DEDICATION

T O M Y F A M I L Y

ABSTRACT

This research aims at helping industrial innovators convert technological achievement into economic success.

The underlying axiom of the study is that the likelihood of a commercial "big hit" is a direct function of the adaptation of selling efforts to the potential customers' idiosyncracies. This raises theoretical, epistemological and practical questions.

Theoretically, the problem is to identify a conceptual framework within which organisational idiosyncracies can be understood and defined.

Epistemologically, the problem is to identify a methodological basis on which these indiosyncracies can be assessed and tested as to their influence on the adoption of industrial innovations.

Practically, the problem is to identify an operational marketing approach in which this type of influence can be taken into account and exploited.

The theoretical problem is solved in meta techno-economic terms. The concept of organisational climate is used to encompass the various corporate idiosyncracies under attention.

The epistemological problem is solved by applying strategic analysis to decision-making processes related to the adoption of new information technologies.

ABSTRACT

Concepts such as organisational rationalities, strategies, stakes, zones of uncertainty and coalitions are found to explain and account for the influence of corporate idiosyncracies on decision processes in three large (or multinational) French companies faced with commercial proposals to adopt computer-based business information systems.

The practical problem is solved by proposing a design to assess idiosyncratic strategic factors in target organisations and by suggesting how commercial approaches can be developed accordingly.

The research solutions are bounded by three limits: the respective influence of strategic factors as opposed to other organisational idiosyncracies was empirically untestable; the validity of the conclusions is highly dependent on the field which was investigated (any a priori generalisation to non-informatic innovations is thus problematic); and lack of information may constrain assessment of strategic factors.

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CHAPTER I

PURPOSE, PERSPECTIVE AND LIMITS OF THE RESEARCH

0. Introduction

The starting point of this research is based on the conjunction of two striking phenomena:

(i) More than two thirds of the failure in the technology transfer process occur in the commercialisation phase. Nonetheless, this phase represents up to eighty percent of the total cost of bringing an innovation to commercial success.[1]

(ii) Most of the researches concentrating on the techno-economic determinants of commercial success leave more than a substantial unexplained variance in the sequence in which firms adopt or reject technological innovations.[2]

What conclusion can be drawn from these? The central idea of this dissertation is that the latter phenomenon may significantly account for the former. If this is true, it is possible to help converting technological achievements into commercial successes by focusing attention on the variance mentioned above. Researchers may resort to two independent strategies so as to reduce the unexplained variance:

(i) Convergent strategy: sharpening techno-economic conceptual tools so as to give rise to a body of analyses accounting for commercial successes and failures in terms of factors not contained in current statements of the reasons underlying

success and failure. Usual techno-economic indicators will refer to expected return on investment, product performance, complexity, relative superiority, cost, etc; company level of marketing investments (e.g. in sales personnel or market research), R & D efforts, etc.

(ii) Divergent strategy: resorting to conceptual tools no longer exclusively borrowed from technology and/or economics so as to generate a body of explanations liable to complete the techno-economic analyses. Such tools will refer to concepts as varied as organisational behaviour, consistency of marketing orientation, attention paid to customers requirements or idiosyncracies, etc.

The present research adopts the second approach. Two major reasons justify this divergent strategy:

(i) It is more and more difficult to demarcate new significant techno-economic indicators ("independent variables") whose combination may account for successes or failures in the commercialisation of technological innovations. Consequently, the independent variables the researchers may use to explain or predict successes or failures are more and more likely to be inter-correlated; which means that no significant reduction of the unexplained variance is likely to be derived from the calculus.

(ii) Recent developments in decision theory, systems analysis and social sciences - particularly in the field of micro-sociology and organisational behaviour - indicate that an increasing number of corporate processes are amenable to non-strictly techno-economic appraisals.

In recapitulation, the thesis purports to contribute to the marketing of technological innovations by:

(i) Focusing on the possible determinants of success and failure in the commercialisation of technological innovations;

(ii) Suggesting an alternative conceptual framework to assess these possible determinants and their respective probable influence;

(iii) Proposing a marketing strategy capable of guiding commercial efforts according to the possible determinants.

The concept of idiosyncrasy is often used in this research. The term "idiosyncrasy" will denote any characteristic, attribute and quality of the company which is specific to it.

For the firm willing to market the technological innovation, the marketing problem is easy to state: on the one hand, there is a product, process or service; on the other hand, there are potential clients; the puzzle is to have the former purchased by the latter.

At this stage, it must be noted that the research focuses on adoption rather than diffusion processes. Chapter II provides a clear-cut distinction between these processes. The researcher interested in diffusion problems can resort to a relatively recent work by Krishnamurthy where it is shown that binomial, polynomial or stochastic diffusion models are difficult to obtain because of the dynamic dimension of the phenomenon.[3] Another viewpoint on the commercialisation of innovations can be selected, that of the post-adoption phase; this perspective is interesting as it concentrates on the concept of process but is often concerned with consumer goods, as is shown by Black's research.[4]

To assist clarity of exposition, a semantic aspect of the question must clarified from the outset. The firm which proposes the innovation may, in fact, wish to sell it, rent it, market it, etc.; such a firm will be labelled an "addressing system". Symmetrically, the firm(s) to which the innovation may be proposed will be called the "addressed system(s)". Finally, there may be

various types of innovation: products, processes, services, etc. To avoid any ambiguity, it will be often referred to the concept of "innovation system".

However, stating the problem in terms of systems offers more than a mere semantic clarification. Too often, marketing falls into the trap of disjunctive reasoning. Consider, for example, the usual dichotomy: "The innovation system is either accepted or rejected". In fact, it is sometimes difficult, if not misleading, to apply this disjunction to organisational phenomena: in some cases it may be impossible to say whether a given company has adopted the innovation or not (see, for example, the case of Barracuda Corporation in Appendix III). This disjunctive perspective is underlain by a static and analytic appraisal of the problem: on the one hand, there is the potential adopter; on the other hand, the innovation; the two elements are thought of separately.

A system approach to the potential client and innovation poses the problem in dynamic terms: To what extent can the latter become a subsystem of the former? This approach is of twofold interest: first, it deals with compatibility ("more or less") rather than exclusivity ("yes" or "no"); second, it supposes a continuum, a relationship which must be investigated - and exploited - between the addressed systems and the innovation systems. Understanding and developing this relationship is the major problem of the innovator.

The study of the compatibility and continuum can be carried out through the following steps:

(i) Statement of the marketing problem and elucidation of the concept of compatibility;

(ii) Choice of "organisational climate" as a synthetic denotation

for the non-strictly techno-economic corporate idiosyncracies of the addressed systems: legitimation of the choice and implications for this research structure;

(iii) Epistemology: genealogy and praxiology of the organisational climate approach;

(iv) Technology: the problem of its generation and adoption;

(v) Interface: decision-making;

(vi) Methodological and empirical implications.

The first section of this chapter concentrates on the two first points and sets the guidelines of the research. The second section deals with the four latter points and explains why and how they are treated in the thesis.

SECTION 1 GUIDELINES

This section comprises two major arguments aimed at justifying the central orientation and perspectives of the research. The discussion allows for sketching the purpose and structure of each chapter.

1.1. Stating the Marketing Problem and Elucidating the Concept of Compatibility

From a marketing viewpoint, the central objective of the addressing systems is to accelerate and facilitate the adoption of the innovation systems by the addressed systems. Generally, the problem is to turn a technological achievement into a commercial success. As mentioned in the opening lines of the introduction, this passage is often a difficult one. However, a systems approach to the question suggests that an innovation system can all the more easily become a subsystem of an addressed system if the two systems

are compatible.

Compatibility is a relational notion, implying at least two objects. It is also a continuous predicate: there are various levels of compatibility. Accordingly, it is possible to view this notion as a relation, not in the binary sense, but in the sense of fuzzy set theory: there are not only two alternatives (the relation exists or it does not) but, on the contrary, there is a continuum on which one can measure the intensity of the relation of compatibility between two objects. Besides, group theory shows that a relation always involves three entities: an origin-set, a goal-set and a graph. As regards the present study, at any given time, the origin-set consists of the innovation systems proposed by the addressing systems, the goal-set consists of the addressed systems and the graph is a set of triplets of the form: (innovation system, addressed system, intensity of the compatibility). The marketing objective of each addressing system is therefore to demarcate all the triplets such that:

(i) The first term of each triplet is the innovation it is in charge of;

(ii) The third term of each triplet (i.e. level of estimated compatibility between the relating addressed system and innovation system) seems high enough to lead to adoption.

Then, the set consisting of the second term of such triplets furnishes the target market segment for the related addressing system. Obviously, this approach hinges on what is meant by "compatibility". To assess compatibility between organisations and technologies, it is necessary to arrange these into categories, since it is economically unbearable, if not practically impossible, to compare each individual organisation and technology. Then arises the question of the categorisation criteria, all the more

complex as there are numerous viewpoints on technologies and organisational idiosyncracies. Chapter II tackles the categorisation problem. The point that emerges from the analysis is that strictly techno-economic variables are not sufficient to totally account for all the phenomena affecting organisations. Gibson's recent thesis supports this viewpoint, on which hinges the present research.[5] This leads one to the question of the approach which will be selected in order to handle a non-strictly techno-economic appraisal of the addressed sytems.

1.2. "Organisational Climate" as Synthetic Denotation for the Corporate Idiosyncracies of the Addressed Systems: Legitimation of the Choice and Implications for this Research Structure

Organisational studies, and mainly those dealing with the adoption of technological innovations, when confining their investigation to techno-economic variables, are generally left surmising the existence of "contextual" idiosyncracies supposed to explain - altnough one cannot make explicit the nature of the explanation - a substantial fraction of the phenomena. Chapter II shows that, too often, when researches go beyond the techno-economic boundaries, the variables are vague and loosely characterised as emanations or resultants of techno-economic parameters which the researchers' conceptual and methodological tools fail to account for in a practical way. This is why, as already pointed out, the present research adopts the course of concentrating on organisational characteristics beyond purely technological or economic ones ("meta techno-economic characteristics"), with a view to studying how to facilitate the adoption of industrial innovations.

This type of approach relates to a body of researches referring to "corporate culture", "behavioural theory of the firm", "organisational climate", etc. These researches have in common an

emphasis on organisational specificities which do not boil down to purely techno-economic indicators. As suggested by the literature, corporate idiosyncracies can be denoted in various ways. The diverse terms (e.g. organisational culture, climate, personality, atmosphere, etc.) are not synonymous, and the choice between them is dictated by the researcher's primary concern (e.g., micro-sociology, management, anthropology, etc.). However, each term is viewed as a synthetic denotation for the organisational idiosyncracies which the researcher intends to study (e.g. paramount beliefs, norms, values, legends, level of stress, etc.).

The heuristic richness of the concept drives one to choose "organisational climate" as a generic expression of the organisational idiosyncracies this research will focus on. Chapter II provides an introductory overview of this concept which is studied at length in Chapter III. To legitimate the choice, it is sufficient to say that the "organisational climate" term is both comprehensible and comprehensive: it is suggestive, speaks to intuition, allows for wider communication and can be easily understood by non-experts. Besides, the concept is flexible enough to apply to a broad field of phenomena and, accordingly, is able to generate a wide range of diversified researches. These properties allow the concept to appear as a propitious vector for the development of new knowledge and practices.

On the other hand, managerial tradition seems to favour this term, be it from a descriptive,[6] prescriptive,[7] prospective[8] or educative[9] viewpoint. In other words, the organisational climate concept seems to furnish a promising basis for discussion with managers whose natural background does not predispose them to ethnological, psychological or sociological considerations.

Consequently, the various addressed systems will be considered under the aspect of their organisational climate. This enables one

to expose the problem more accurately.

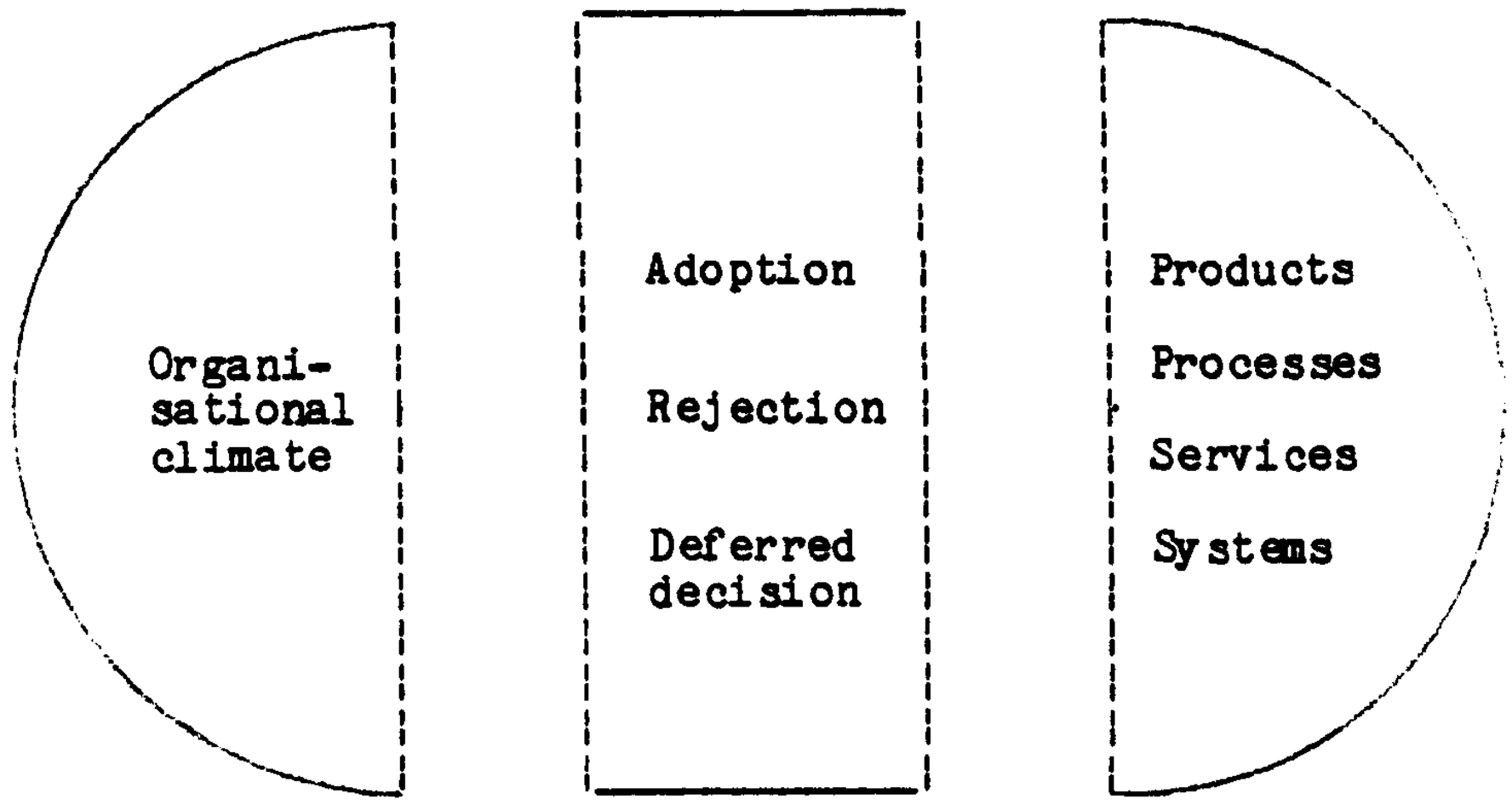
The relation of compatibility mentioned above is therefore thought of as existing between organisational climates and technological innovations. These notions have given rise to two bodies of investigations which the present research must try and relate.

The problem can be compared to that of building a sphere with two hemispheres which, hitherto, are conceptually unrelated.[10] The first hemisphere consists of the body of investigations related to non-strictly techno-economic corporate idiosyncracies in general, and organisational climate in particular; the second hemisphere comprises the body of investigations related to the adoption of technological innovations.

The construction of such a (so far problematic) sphere would result from the conceptualisation of an interface between these two aspects of the firm: organisational climate and innovation adoption. Such interface can only be organisational decision-making process, since only organisational decision offers this twofold aspect: that of being the decision of organisational actors, and that of being the decision to do something in the organisation.

Briefly, decision-makers are both related to their company's climate (inasmuch as they belong to the organisation, and therefore are affected by its climate: first hemisphere), and related to the decision (inasmuch as they are involved in the process of adoption or rejection of the innovation: second hemisphere). The following figure illustrates the foregoing considerations:

Fig.1- The research problem



[* It is acknowledged that all corporate idiosyncracies are not elements of the organisational climate]

Accordingly, the next task is to examine the three elements which enable the construction of the sphere. A theoretical examination of each of the three components of the problem is successively carried out in Chapters III, IV and V.

Chapter III raises genealogical ("Where does the organisational climate concept come from?"), epistemological ("What is the status of the organisational climate approach, is there a theory of organisational climate?") and praxiological ("What is the 'practice' of the organisational climate approach, how is the concept defined and treated in the literature?") questions. Various answers and perspectives are proposed.

Chapter IV concentrates on the generation and adoption of technological innovations. The analysis is carried out from the double viewpoint of the addressing and addressed systems. Normative, descriptive and predictive perspectives are successively considered.

Chapter V deals with the interface between organisational

climate and industrial innovation adoption. Decision-making is considered at both individual and collective levels, and the problem of the transition from the former to the latter is tackled. In the light of the foregoing analyses various propositions are suggested.

Chapter VI presents a synthesis of these propositions in the form of hypotheses. The chapter is mainly methodological and raises the question of how to collect, analyse and assess information in order to test the hypotheses.

Chapter VII is mostly empirical and proposes a test of the hypotheses. Three case studies furnish the material of the test, and practical conclusions are drawn from the analysis. The conclusions are meant to help innovators approach potential clients in an efficient way.

SECTION 2 CRITICAL POINTS

This section examines the major concepts and problems raised by the research. Their respective relevance is assessed from the double viewpoint of the problem to solve and the current managerial literature.

2.1. Epistemology: Genealogy and Praxiology of the Organisational Climate Concept

Despite the widening body of studies devoted to non-strictly techno-economic corporate idiosyncracies in general and organisational climate in particular, a fundamental point remains ignored: What is the epistemological status of the related researches? Such a question is of crucial importance in social sciences, and its resolution should contribute to establishing even more enriching relations between marketing and disciplines such as sociology,

anthropology and psychology. Briefly, is there a theory, a model or a paradigm of organisational climate? To answer this question, one has to examine the genealogy and the praxiology of the concept.

The first section of Chapter III studies the theories going beyond strictly techno-economic appraisal of organisations, and shows that these theories can be divided into two main clusters: positivistic doctrines (a priori and non-a priori ones) and non-positivistic doctrines (non-a priori ones). Each of these doctrines is judged upon the criterion of its fitness to allow for a conceptualisation of the interface between non-strictly techno-economic idiosyncracies and the adoption of technological innovations. The first section of Chapter III concludes by demarcating two approaches which seem relevant to such a conceptualisation.

In order to assess the status of the organisational climate approach, it is interesting to examine how the concept is treated in the literature. How is organisational climate defined by theorists and researchers, how do they assess its influence on the firm's life? These are praxiological questions (i.e. they deal with the "praxis" of the approach) and the second section of Chapter III is aimed at answering them. In this respect, it is important to notice that the way in which organisational climate is assessed by the researchers is strongly determined by their definition of the concept and the dimensions of which they consider it consists. These points are also tackled in the second section of Chapter III. Accordingly, the very viewpoint on organisational climate, the way it is thought of by the researcher, must be carefully considered, if one wants to sidestep methodological traps. Examples of such traps illustrate these considerations. To clarify these inherent praxiological problems, practical definitions of the organisational climate approach must be given, which is done in the third section

of Chapter III, before concentrating on the question of the epistemological status of the concept. Finally, the question is solved and the conclusion to Chapter III suggests an alternative perspective on organisational climate, which should account for interactions between the actors and their company's idiosyncracies (as these determine the organisation's climate). This perspective is based on strategic analysis, and will be clarified, refined and subtantiated throughout the whole research.

However, the above considerations are poor indications as to the other side of the problem, that of technological innovation.

2.2. Technology: the Problem of its Generation and Adoption

The first section of Chapter IV hinges on the generation of technological innovations in addressing systems. The crucial role played by industrial innovation in the determination of the addressing systems' corporate strategies was exhaustively covered by Rothberg.[11] A study of innovating companies, in an attempt to delineate factors facilitating innovation and barriers hindering it, pointed out characteristics such as management style and climate.[12] More recently, Quinn was tackling the problem of how big companies could stay innovative. His analysis of managerial practices of successful large companies concludes that technological innovation in large enterprises is all the more successful as these companies accept the "essential chaos of development", pay close attention to their users' needs and desires, avoid detailed early technical and marketing plans, and allow entrepreneurial teams to pursue competing alternatives within a clearly conceived framework of goals and limits.[13] Innovation is so fundamental for companies that a survey of successful innovations put particular emphasis on the personal qualities that product planners and innovators should have.[14] In

this respect. Abend went as far as to view innovation as the "missing link in productivity" in an article underscoring that a systematic approach to technology development is vital for the company's productivity.[15]

After examining the "normative theory of innovation", the first section of Chapter IV discusses empirical studies related to success and failure in the commercialisation of technological innovations. As noticed by Baker, a review of the literature suggests that most of the studies neglected causes of failure imputable to the commercialisation phase itself.[16] The present research aims at bridging this gap by emphasising the necesssary adaptation of the commercial strategy and selling tactics to the addressed system's idiosyncracies. This raises the question of the adoption process of technological innovations.

This question is examined in the second section of Chapter IV. At the organisational level, the adoption process has given rise to various models which generally resort, in a more or less implicit way, to the following concepts: organisational awareness, relevance, opportunity and evaluation. A substantial fraction of this section is devoted to discussing these concepts. This examination is carried out on the basis of simple interrogations such as: Are these concepts clear, are they helpful for marketers, can they be operationalised, etc.? The answer to these questions provides guidelines for the generation of the hypotheses of the research. Those models hinge on the passage from individual formalisation to collective formalisation of behaviours and attitudes. Accordingly, close attention must be paid to individual models of adoption.

At the collective level, there are various types of adoption models. After determining which type is the most relevant to the present study, the second section of Chapter IV proposes an

examination and an evaluation of seven pertinent models. The evaluation gives rise to a synoptic table which grades the models according to various practical and theoretical criteria.

These models are not presented for the sake of exhaustivity, but because they are of practical interest for marketers. Indeed, models usually provide a priceless basis for segmentation activity. The importance of segmentation for the communication of innovations was highlighted by Jager[17] and Eckrich and Peter[18] among others. However, as far as technological innovations are concerned, macro-segmentation (operated on the basis of criteria such as geographical location, size, type of activity, type of suppliers and customers, etc.) must be completed by micro-segmentation, as indicated by the Scanner Case Study by Wind et al.[19] Micro-segments generally regroup, within a same macro-segment, firms with similar decision-making procedures or processes. By advocating a systematic approach to the strategies and rationalities of the addressed systems' decision-makers, this research purports to contribute to segmentation theory. The importance of decision-making, rationality and strategy for the study of the interface between organisational climate and the adoption of technological innovations leads one to focus analysis on these concepts.

2.3. Interface: Decision-Making

Chapter V is entirely devoted to this analysis and its first section opens with a discussion of the concept of decision-making. The central question is: What is a decision, what does it consist of? The key role of decision-making in management, particularly in the framework of high technology products where "venture capital" is a vital factor, is enhanced in a recent article by Lederrey.[20] The problem of decision-making, in the front of change always thought of

as uncertainty bearer, is so crucial that it has given rise to prescriptions of rationality on the basis of the formalisation of goals and objectives within systematic planning.[21] A more recent article reports on a study of decision-making procedures in three Dutch organisations.[22] This analysis uses the "influence-power continuum" as an independent variable; dependent variables include efficiency, achievement, satisfaction with the process and with the outcome, while contingent factors include clarity of goals, conflicts and meta-powers as well as the nature of the decision. In spite of its efforts of conceptualisation, this study sheds poor light on a fundamental point for management: to which type of rationality obey individual actions, and what is the nature of the transition from individual to collective decisions.

The first point is dealt with in the second section of Chapter V through a critical review of the theories of individual rationality (and strategy). Rationality becomes increasingly central in controversial debates on management, as is suggested by some articles by Quinn and McGrath,[23] Bazerman and Schoorman,[24] Dyckman[25] and Bryman[26]. The role of irrationality in organisational change was recently underscored by Brunsson.[27] The second section of Chapter V suggests an answer to the problem of the nature of the transition from individual to collective decisions. However, the concept of collective decision raises another problem, that of organisational decision-making.

The problem of organisational decision-making is more akin to the central question of this research and, accordingly, the third section of Chapter V is devoted to solving it. The interrogation on which hinges the whole section is the following: What models of collective decision-making exist in the literature, and which of these allow for an analysis both in terms of non-strictly techno-economic corporate idiosyncracies and adoption of technological

innovations? Again, organisational decision-making remains at the core of contemporary management debates as illustrate researches by Murray,[28] Narayanan and Faney,[29] and Butler et al.[30] Finally, Chapter V concludes with synoptic tables summarising alternative perspectives on decision-making, rationalities and strategies. The conclusion to Chapter V provides a recapitulation of the problem accurate enough so that it becomes possible to concentrate on the question of what research methodology to adopt in order to understand the influence of organisational climate on the adoption of technological innovations. In turn, answering this question involves empirical implications.

2.4. Methodological and Empirical Implications

Chapter VI is devoted to identifying and discussing the most relevant design, method and data analysis procedures for the empirical research. No research can start without at least one postulate and more or less explicit hypotheses. Postulates are not to be proven, but the more likely they are, the better. Explicit hypotheses must be tested, and this is the purpose of the empirical research. This research's postulate and hypotheses are derived from the critical review of the literature carried out in the preceding chapters. Once the postulate is exposed, the hypotheses stated and the adequate research design characterised, another problem emerges, that of the sample. The sample must allow for a verification (or a counter-verification) of the hypotheses and be bias free. The first section of Chapter VI deals successively with the questions of the postulate, hypotheses, design and sample of the research, and explains why information technology is chosen as the field for the empirical research. The second and third sections assess research and data analysis methods as to their respective

ability to confirm or infirm the hypotheses. Major emphasis is put on avoiding biases and, accordingly, various scenarios of analyses are given in the conclusion to Chapter VI. Since, at this stage, nothing is known about the kind of empirical works that will be possible (i.e., Will it be possible to make as many interviews as necessary, will the interviews enable statistical analysis to be performed, etc.?), each scenario stands as a possible response to an eventual empirical situation. In brief, these research scenarios hinge on the following alternative methods for analysing the data:

(i) Phenomenological protocol analysis (see Exhibit 6.A.);
(ii) Content analysis (see Chapter VI, 3.2.2.);
(iii) Strategic analysis (see, in particular, Exhibit 6.C.);
(iv) A combination of (i), (ii) and (iii) with the support of a log.-linear model (see Chapter VI, 3.3.).

Chapter VII is devoted to discussing the hypotheses in the light of the information gathered from the empirical research. Its first section opens with a brief presentation of the information technology field and assesses the extent to which information systems can be associated with innovation, before presenting the preparatory research which helped in identifying the firms which were to be approached.

The second section of Chapter VII introduces the material of the test (three case studies on French companies which were, or are still, faced with the problem of whether to adopt new information technologies) and justifies the use of strategic analysis to handle the test. The case studies have been chosen on the following basis: (i) they belong to the sample; (ii) they are significant and comparable in terms of turnover and size; (iii) they allowed interviews to be performed.

On the basis of the case studies, the third section of Chapter

VII analyses the hypotheses and discusses their respective validity. The perspective in which the hypotheses are tested is both practical and theoretical. The test aims at:

(i) Assessing the influence of organisational climate on the decision-making processes related to the adoption of technological innovations;

(ii) Testing the power of strategic analysis to account for differences in the decision-making process outcomes;

(iii) Evaluating the relevance of strategic analysis for the marketing of technological innovations.

3. Conclusion of the First Chapter

Although the validity of the research conclusions is limited to the domain to which the innovation systems belong (i.e. to the field of innovation technology), various practical lessons can be drawn from the analysis.

Similarly, the empirical findings allow the characterisation of the interface between corporate idiosyncracies (inasmuch as they constitute the organisational climate) and the adoption of technological innovations.

These marketing suggestions (i.e. a marketing strategy capable of guiding commercial efforts according to the micro-politics and strategic factors affecting decision-making processes related to the adoption of technological innovations) and the final characterisation (i.e., What is organisational climate, how does it influence decision processes?) are exposed in the general conclusion to the thesis (Chapter VIII). However, three questions are left open:

(i) What is the respective influence of strategic factors as opposed to other corporate idiosyncracies? (The question is answered, but the solution is more theoretical than empirical.)

(ii) Can the conclusions be extended to innovations alien to information technology?

(iii) Is it always possible to perform strategic analysis before marketing a technological innovation?

It is hoped that further research will provide answers to these interrogations.

CHAPTER I

NOTES AND REFERENCES

1- See: Materna, A.T. Study of management factors affecting innovation diffusion of high technology. Ph.D. thesis, Claremont Graduate School, 1981.

2- See:

- Baker, M.J. (Editor) Industrial innovation: technology, policy, diffusion. London, Macmillan, 1979. (In particular p.347)

- Parker, J.E.S. The economics of innovation - The national and multinational firm in technological change. London, Longman, 1974. (In particular p.118).

3- Krishnamurthy, R. Some adaptations of innovation diffusion models. D. Eng. thesis, Asian Institute of Technology, Thailand, 1981.

4- Black, W.C. An analysis of the post-adoption period in the diffusion of innovations. Ph.D. thesis, The University of Texas at Austin, 1980.

5- Gibson, D.V. Determinants of organisational structure and process: technological versus cultural explanations concerning innovation management. Ph.D. thesis, Stanford University, 1983.

6- See: Paolillo, J.G., & W.B. Brown. How organisational factors affect R & D innovation. Research Management, vol.21 (2), 1978, pp.12-15.

7- See: Hill, W. How organisational philosophy influences management development. Personnel Journal, vol.59 (2), 1980, pp.118-120.

8- See: Offenberg, R.M., & V. Cernius. Assessment of idiographic organisational climate. Journal of Applied Behavioural Science, vol.14 (1), 1978, pp.79-86.

9- See: Baumgartel, H., L.E. Dunn & G.I. Sullivan. Management education, company climate and innovation. Journal of General Management, vol.4 (2), Winter 1976-77, pp.17-26.

10- Previous researches have already dealt with relating the two hemispheres. However, they were generally mostly concerned with testing empirical relationships. That is, they focused on assessing the influence of organisational contexts on adoption processes. See, for instance:

- El-Sherbeny, A.F.M. Behavioural and organisational influences upon the adoption of industrial products innovation. Ph.D. thesis, University of Strathclyde, 1978.

The present research is concerned with both empirical and conceptual viewpoints.

11- Rothberg, R.R. (Editor) Corporate strategy and product innovation (second edition). New York, The Free Press, 1981.

12- Anon. Creativity and innovation study: progress report. Planned Innovation, vol.1 (5), May 1978, p.186.

13- Quinn, J.B. Managing innovation: controlled chaos. Harvard Business Review, May-June 1985, pp.73-84.

14- Sands, S., & K.M. Warwick. Successful business innovation: a survey of current professional views. California Management Review, vol.20 (2), 1977, pp.5-16.

15- Abend, C.J. Innovation management: the missing link in productivity. Management Review, vol.68 (6), 1979, pp.25-28 and 38.

16- Baker, M.J. Market development. Harmondsworth, Penguin Books, 1983, p.30.

17- Jager, H.W. Market segmentation and innovation. European Journal of Marketing, vol.14 (9), 1980, p.31.

18- Eckrich, D.W., & J.P. Peter. Identifying adopter categories: a suggested design. AMA Combined Proceedings, No.37, 1975, pp.187-190.

19- Wind, Y., T.S. Robertson & C. Fraser. Industrial product diffusion by market segment. Industrial Marketing Management, vol.11 (1), 1982, pp.1-8.

20- Lederrey, J.L. Creation d'entreprises: l' Europe a besoin d'une "industrie du capital-risque". Journal de Geneve, JA No. 110, May 1985.

21- Marchione, A.R., & J. English. Managing the unpredictable... A rational plan for coping with change. Management Review, vol.71 (2), 1982, pp.52-57.

22- Anon. A contingency model of participative decision-making: an analysis of 56 decisions in three Dutch organisations. Journal of Occupational Psychology, vol.56 (1), 1983, pp.1-18.

23- Quinn, R.E., & M.R. MacGrath. Moving beyond the single solution perspective: the competing values approach as a diagnostic tool. Journal of Applied Behavioural Science, vol.18 (4), 1982, pp.463-472.

24- Bazerman, M.H., & F.D. Schoorman. A limited rationality model of interlocking directorates. Academy of Management Review, vol.8 (2), 1983, pp.206-217.

25- Dyckman, T.R. The intelligence of ambiguity. Accounting, Organisations and Society, vol.6 (4), 1981, pp.291-300.

26- Bryman, A. Organisation studies and the concept of rationality. Journal of Management Studies, vol.21, 1984, pp.391-408.

27- Brunsson, Nils. The irrational organisation: irrationality as a basis for organisational action and change. Chichester, John Wiley, 1985.

28- Murray, J.A. Toward a contingency model of strategic decision. International Studies of Management and Organisation, vol.8 (4), Winter 1978-1979, pp.7-34.

29- Narayanan, V.K., & L. Fahey. The micro-politics of strategy formulation. Academy of Management Review, vol.7 (1), 1982, pp.25-34.

30- Butler, R.J., W.G. Astley, D.J. Hickson, G. Mallory, & D.C. Wilson. Strategic decision-making concepts of contents and process. International Studies of Management & Organisation, vol.9 (4), Winter 1979-1980, pp.5-36.

CHAPTER II

THE PROBLEMATIC SPHERE

0. Introduction

As suggested in Chapter I, the elucidation of relationships between non-strictly techno-economic corporate idiosyncracies and the adoption of technological innovations can be viewed as the problem of reconciling two hemispheres into a general sphere. The first hemisphere relates to organisational climate, and the second refers to technological innovations. Before concentrating, in the second section of the chapter, on how the problem has been hitherto treated in the literature, a brief overview of the concepts involved should be achieved. The first section of this chapter is devoted to such a characterisation.

SECTION 1 BASIC PRELIMINARY DEFINITIONS

Although the present study is essentially concerned with industrial marketing, i.e., in Hutt and Speh's words, with the marketing of goods, systems or processes "used in producing consumer products or services, in producing other industrial goods or services, or in facilitating the operation of an enterprise", clarifying the premises of the general theory of innovation (i.e., connected indistinctly to consumer or industrial goods) could prove useful.[1] Finally, the last discussion of the section proposes opposed, or symmetrical, definitions of the two concepts under consideration. By doing so, it is meant to avoid one-sided and biased understanding of the problem.

1.1. Centrifugal Typology

Fig.2 displays some of the labels which revolve around the concept of innovator. However, none could be taken as an acceptable synonym ; all deviate, to a greater or lesser extent, from what the

notion of innovator actually implies.

Fig.2- Centrifugal typology around the innovator concept

(1) Dreamer:
meditation, fantastic ideas, vain illusions, chimera, utopia.

(2) Creative:
generation of original ideas, often unstructured.

(3) Creator:
designing of prototypes, of technically and aesthetically achieved entities.

(4) Discoverer:
"enlightenment", which may prove useful or not.

(5) Inventor:
generation of the idea of a new combination of existing entities.

(6) Innovator:
development and diffusion of concepts or entities implying a change in behaviour.

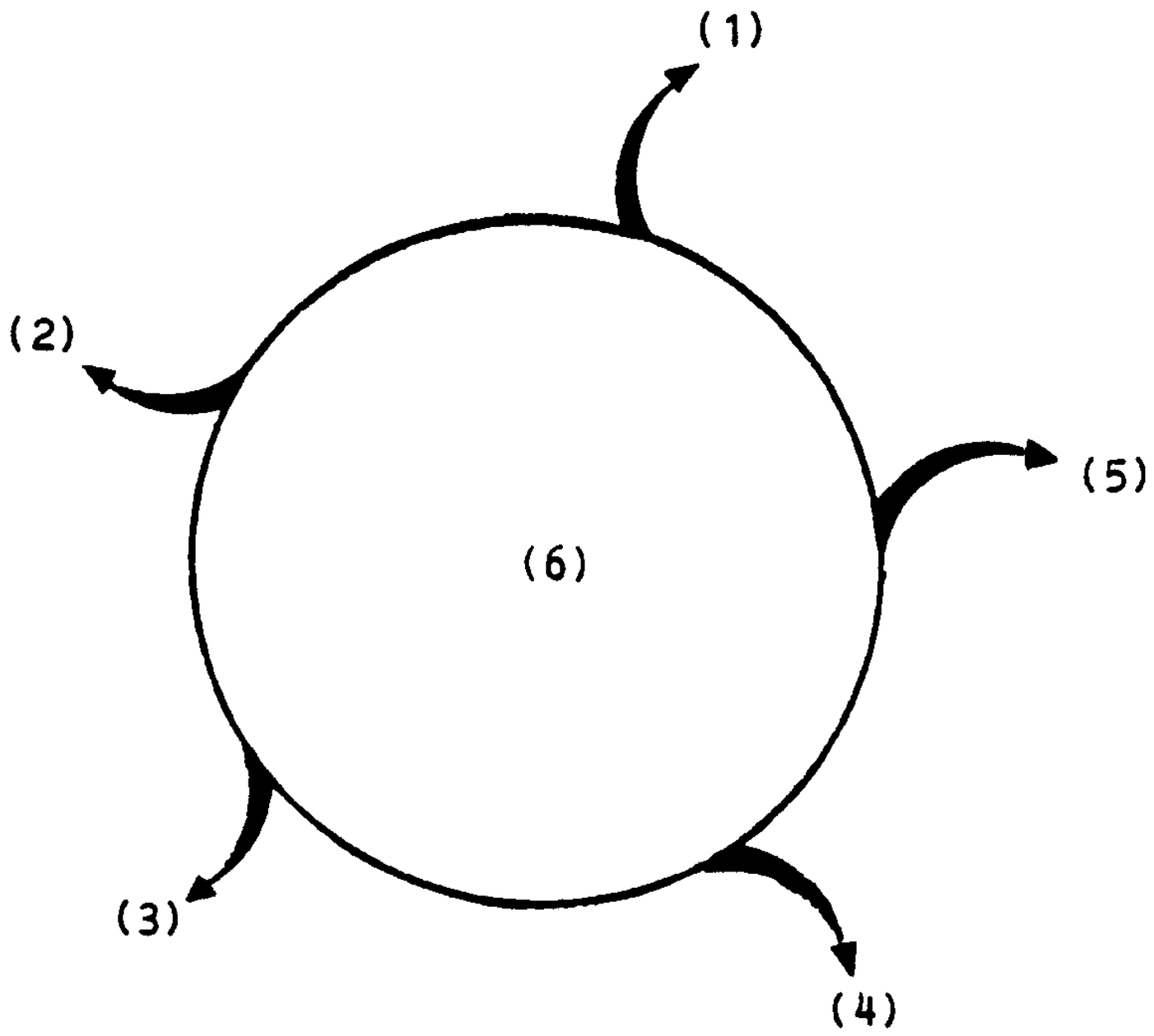
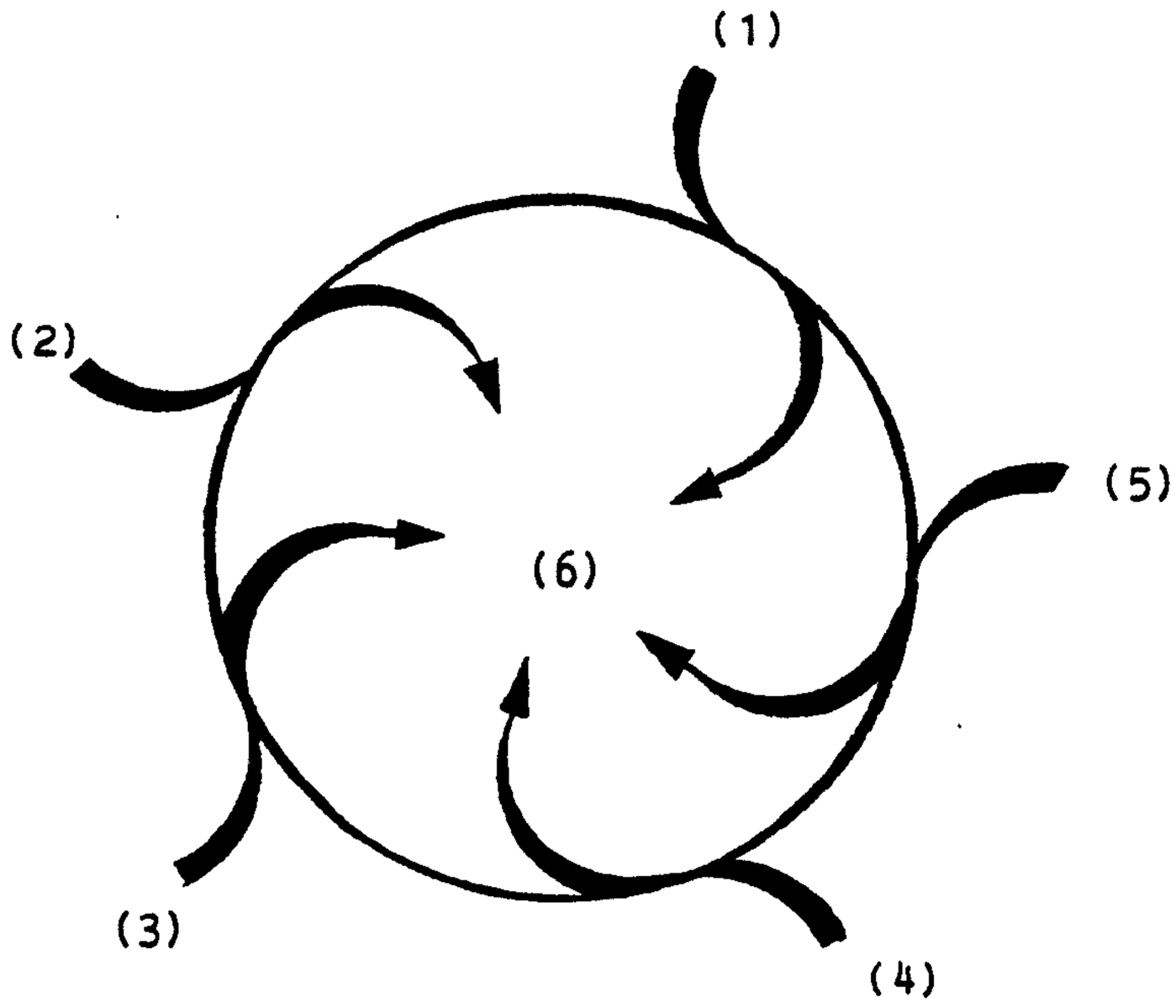


Fig.3- Centripetal synthesis around the innovator concept



1.2. Centripetal Synthesis

Each actor displayed in Fig.2 and Fig.3 shares few or numerous characteristics with the innovator, who draws upon each of the types, achieving a "centripetal" synthesis (See Fig.3). However, the major conceptual connection embraces the notions of innovation and invention. Empirically, it is not an easy task to disentangle what is ascribable to the latter from what refers to the former. As Langrish et al. have it:[2]

> "...invention and innovation are to be distinguished, but they are not separate. They are often inextricably interlinked because they stand mutually in a mixed cause relationship: each is part cause, part effect of the other."

The following sub-section deals with working out a practical distinction.

1.3. Innovation and Invention

In his case study of the international diffusion of the semi-conductor technology, Tilton proposes a clear distinction between the two concepts:[3]

> "The first workable model of a new product or process is often referred to as an invention, and its first commercial production or use as an innovation."

However, most of the literature on creativity treats the term innovation as synonymous with invention. Steiner,[4] or Myers and Marquis,[5] for instance, consider innovation and invention as synonyms when they hold that the former refers to a creative process whereby two or more existing concepts or entities are combined in some novel way to produce a configuration not previously known by the persons involved. This leads one to characterise briefly the three interpretations of invention.

1.4. The Three Theories of Invention

At this stage it should be noted that invention is not to be equated with discovery. As Ralph Linton stressed it:" we may define a discovery as any addition to knowledge, an invention as a new application of knowledge."[6] The present discussion draws heavily on Parker who provides, in his Economics of Innovation, an overview of those theories.[7] It is herein proposed to illustrate the problem as follows:

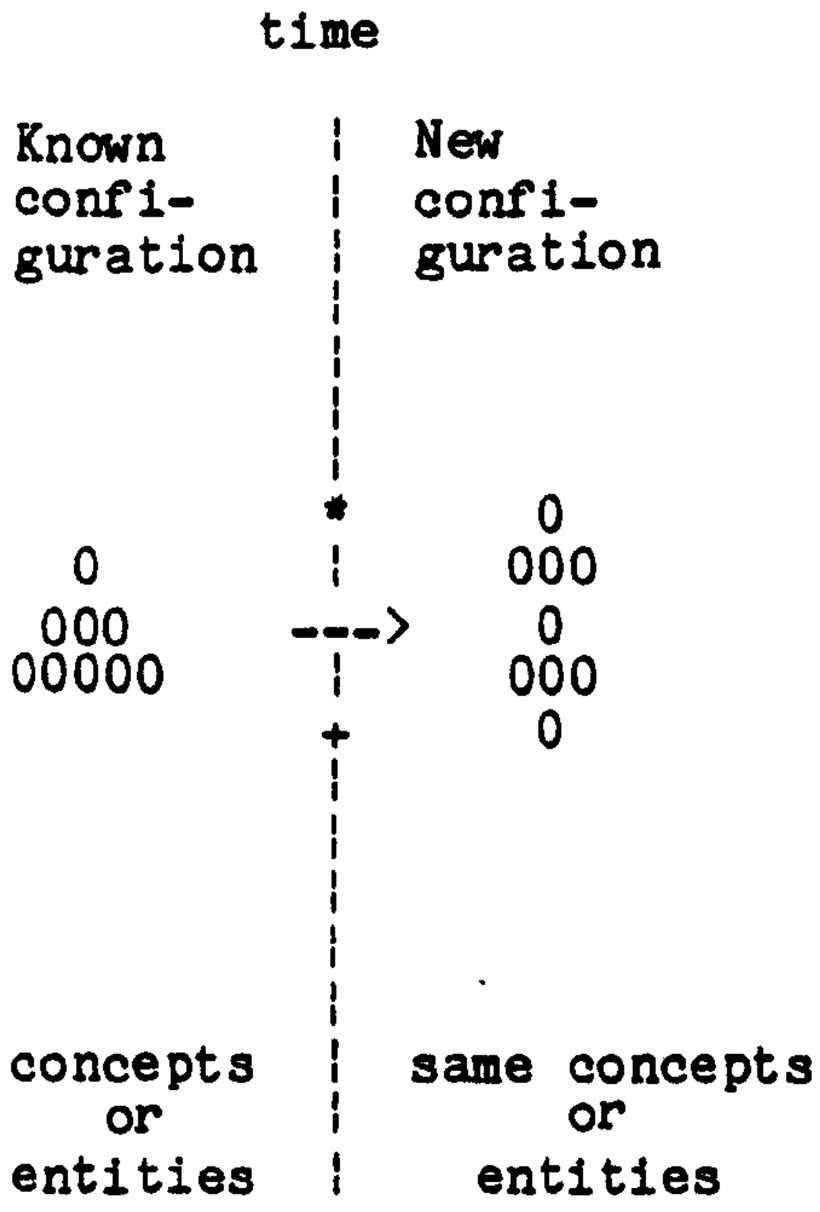


Fig.4- The three theories of invention

The transcendentalist theory attributes invention to the inspiration of a genius (a "star", hence the symbol *). The individual plays a crucial role in this conception; curiosity and fortuitous events predominate. On the contrary, the mechanistic theory adopts the view that invention proceeds under the stress of necessity (it is entailed, almost logically; hence the symbol --->). Needs dictate the direction of change and, as a result, the emergence of inventions; the economic forces are major elements,

and invention is no longer visualised as a transcendental process yelding to unpredictable changes.[8] The cumulative synthesis theory holds that the individual is not merely an instrument in an ineluctable historical progress. Invention is likely to occur to individuals directly concerned with a given problem, provided that they are both able to overcome resistance to change and to achieve a synthesis of what has preceeded (i.e. to realise a sort of intelligent sum; hence the symbol +). The latter view was already held by A. Comte when he wrote that "tne man most justly distinguished by great inventions almost owes the largest share of his success to his predecessors in the same career."[9]

However, inasmuch as these three approaches share the view of invention as a new configuration of existing elements, their common axiom may be considered as a derivative of Lavoisier's principle of conservation, according to which "in every operation.. elements are qualitatively and quantitatively conserved.. there are only changes and modifications."[10]

1.5. The Bounded Domain of the Innovative Function

This sub-section draws on a reflexion unfolded by Papineau in the field of new theories.[11] If one can view an innovation as an economically and technically achievable function, or correspondence, from the set of the existing configurations (of concepts or entities) to the set of the new configurations, then a restriction arises: each given configuration includes, besides a periphery of soft parameters, a hard nucleus of unchangeable connections. Changing those connections would imply a scientific or sociological revolution (in the original meaning of the word). Consider, for instance, Homer's Odyssey. It can be adapted in Braille's alphabet for blind people, on videotapes, etc. Those two types of

presentation are innovations. However, there remains one fundamental relation that the innovator cannot modify at his will nor get rid of. Namely, the connection between Homer's work and the potential customer through the medium of, at least, one of the following senses: hearing, sight, or touch. A revolution, i.e., a fundamental change that would enable this kind of connection to be avoided, could result from the use of telepathy, for example, to have access to Homer's writings.

However, this somewhat idyllic functional interpretation must not lead to underestimating the contingency and complexity of industrial innovation as a "conversion process", in which "managers devote most of their time to dealing with tangible situations" and are preoccupied "with 'things' rather than 'ideas'or 'concepts'."[12]

1.6. Symmetrical Definitions

As regards the concept of industrial innovation, two "opposed" definitions will be provided. Each of them underlines a fundamental dimension of the concept and most of the existing definitions can be considered as a singular compromise between them. For instance, Myers and Marquis view a technical innovation as:[13]

> "... a complex activity which proceeds from the conceptualisation of a new idea to a solution of the problem and then to the actualisation of a new item of economic or social value."

This definition clearly emphasises the technological development inherent in the innovative process. Zaltman et al., in their comprehensive contribution to a global understanding of innovation and organisation, consider an innovation "as any idea, practice, or material artifact perceived to be new by the relevant unit of adoption."[14] The latter definition can apply easily to technological innovations and pays greater attention to the various

unit members' opinion or perception.

Eventually, it remains to be noticed that, in the forthcoming lines, the word "acceptance" refers to the purchasing of the new product or process by an organisation distinct from the one that conceived or produced it; accordingly, it will be sometimes referred to "exogenous innovation". On the other hand, "technical" or "technological", when coupled with "innovation" refer indiscriminately to "industrial."

Similarly, the following sub-section will indicate two possible approaches to the organisational climate concept. From the outset, it is worth noting that the paradigm itself has received various names, each of them stressing different organisational idiosyncracies, specificities and "human sides of enterprises". The most general term is organisational climate, which, according to Baker, is "akin to what a non-behavioural scientist might call corporate personality."[15] The management literature also refers to "corporate identity".[16] However, corporate identity refers very often, in the brand management rhetoric, to the "set of visual symbols that represent a company" (letterheads, vehicles, uniforms, signage, etc.). The latter meaning, in this particular case D.E. Carter's definition, should be distinguished from the one which will be referred to in the following lines.[17] Nevertheless, slight distinctions may separate the conceptions underlying the terms of "managerial attitude", "corporate culture", "corporate identity", "organisational climate", etc. Be they ever so slight, when possible, those distinctions are pointed out in the present research. However, each of these terms aims at denoting a set of non-strictly techno-economic organisational idiosyncracies.

As long ago as 1965, Georgopoulos described organisational climate as follows:[18]

> "... a normative structure of attitudes and behavioural standards which provide a basis for interpreting the [organisational] situation and act as a source of pressure for directing activity."

Clearly, this definition emphasises the role of environmental and reference idiosyncracies. Georgopoulos's conception of organisational climate implies a one-way relationship from the structures to the structured (i.e., organisational units).

In 1966, Litwin and Stringer made a considerable contribution by suggesting that the characteristics, or "idiosyncracies" mentioned by Georgopoulos should be perceivable by the people in the organisation and that a crucial property of organisational climate is the "pattern of expectations and incentive values" that impinge on, and are created by, a group of people who live and work together.[19]

The latter definition enhances the organisational actors' role and pays a special attention to their expectations: Litwin and Stringer expressed a projective-prospective appreciation of organisational climate by emphasising the dynamic relationship between the people, the organisational idiosyncracies and the future.

SECTION 2 STATEMENT OF THE GENERAL PROBLEM IN THE LITERATURE

The general set of questions attached to the present field of research is factorable to the following three dimensions:

(i) Ideal objective ;

(ii) Theoretical means ;

(iii) Methodological implications.

2.1. Ideal Objective

Clearly, the final goal of the kind of study the present one belongs

to is to accelerate and facilitate the adoption of technological innovations or, more to the point, to convert critical factors (in approaching potential adopters) into opportunities. Namely, to enable a technically successful innovation to be transformed into a commercial success.

2.2. Theoretical Means

If "the skill in marketing lies in identifying potential customers, and employing the most effective means to awaken perception and effective demand", as Parker put it, the point is, therefore, to "target the firm's promotional and selling efforts at the most receptive market" together with implementing "the most productive approach to each and every unit of the segment".[20]

The basic postulate that underlies such a strategy will be closely considered later on. However, the researcher can focus on two distinct aspects of the innovative process, whether he is concerned with the diffusion or the adoption of the new product, service or process.

(i) Diffusion study: the researcher is interested in studying the "process by which the use of an innovation spreads and grows".[21] This kind of research must be related to what Mansfield[22] denotes as the inter-firm approach whose object is analysing and assessing the spread "of the [new] process within any industry".[23]

(ii) Adoption study: in this case the researcher deals with the inner process, or "intra-firm diffusion", as Mansfield (op.cit.) expresses it. The researcher is concerned with the various stages a technological innovation must go through before it is accepted or rejected. According to Baker, the adoption of an innovation is the outcome of a sequential

decision-making process.[24]

The present research focuses on the second type of problem. The point at issue is: to what extent does organisational climate (as a set of corporate idiosyncracies) impinge on the inner decision-making process.

2.3. Methodological Implications

In order to gain some insights into how specific firms will react to specific innovations, two major categorisations must be carried out:

(i) A categorisation of the firm under consideration, as potential units of adoption (the "addressed systems");
(ii) A categorisation of the corresponding innovation systems.

Both these notions are amenable to a secondary dichotomy, as the following lines indicate.

2.3.1. Categorisation of Firms

This first categorisation can be worked out either along a techno-economic scale or along an organisational-behavioural one.

2.3.1.1. Techno-Economic Categorisation OF Firms

From the outset, it should be noticed that this type of categorisation is to be distinguished from what the organisational literature refers to through the concept of "a priori categorisation". One of the most widely quoted a priori categorisations is that given by Porter and Lawler who mention the following seven characteristics:[25]

Intra-organisational level:
1- hierarchical level within the organisation;
2- line vs staff;
3- span of control;
4- size of organisational subunits to which the individual belongs.

Inter-organisational level:
5- total size of the organisation;
6- organisational shape (tall vs flat) i.e., the number of organisational levels per capita;
7- centralised vs decentralised organisation

The approach which is herein labelled as a techno-economic one has nothing to do with a-priorism, since it takes into consideration the type of industry, the sector, etc., to which the firm belongs. This type of approach will refer, for instance, to the "size inequalities between firms", the "labour intensity of the adopting industry", and the "rate of growth of the sector" (Davies).[26]

However, other economic/technological characteristics may be found in the literature:

- Financial health, competitive pressure, presence of long lived fixed capital (Parker).[27]
- Monopoly position, access to capital, access to information, R & D's expenditures, possible subsidiaries abroad, productivity (Nabseth and Ray).[28]
- Relationships between the firm and the product (market pressure), the technological pressures, the resources allocation, the results (Bela Gold et al.).[29]
- Environmental constraints (physical, technological, economic and social constraints), and organisational requirements (Choffray and Lilien).[30]

Mansfield, in his early works, and particularly in the Economics of Social Change, suggested most of the characteristics mentioned above.[31] Nevertheless, as far as the most general characteristic

is concerned, namely the size of the firm, it can be traced back to Schumpeter's basic hypothesis of a positive correlation between a firm's size and its technological leadership.[32] In this respect, it is worth noticing that the functionalist writings of D'Arcy Thompson on the relationships between form and force, although written earlier, were published during the same period. This theory rests on the contention that "form [is a] direct resultant and consequences of growth" and, basically, holds that "the form of an object is a diagram of forces in this sense that from it we can judge of or deduce the forces that are acting or have acted upon it".[33]

These natural science principles were the basis for a normative theory of size control in organisational sciences. Haire, for instance, suggested that "by understanding the implications of size... we can avoid inefficient solutions, and direct the development of organisations with conscious planning towards rational ends".[34]

2.3.1.2. Organisational-Behavioural Categorisation of Firms

As Baker reports, most of the researches mentioned above "were forced to conclude that economic factors alone are insufficient to help explain the sequence in which firms adopt innovations, and agreed that 'managerial attitudes' probably accounts for fifty per cent of the variance in this sequence."[35] Among the organisational-behavioural idiosyncracies supposed to bear influence on the adoption process, or on the whole set of the firm's activities, the most generally quoted are the following:

- Values of the organisation as they interfere with the organisational members' values (Burns).[36]
- Degree of specialisation of tasks, degree of flexibility of

hierarchy, type of communications (vertical vs horizontal), degree of centralisation (Burns and Stalker).[37]

- Progressiveness vs unprogressiveness of the organisations, i.e., inter alia, internal willingness to share knowledge, readiness to look outside the firm, effective internal communication and coordination, relative status of science and technology in the firm (Carter and Williams).[38]

- Structural orientation, distribution of influence, character of superior-subordinates relations, character of colleague relations, time orientation (short/long term), goal orientation (manufacturing/scientific), top executive' management style (Morse and Lorsch).[39]

- Organisational structure, management attitudes to the adoption of new techniques, degree of vertical integration (Nabseth and Ray).[40]

According to these researchers, "the least tangible factor, i.e. managerial attitude, is likely to have the greatest impact on the application of new techniques" (op.cit., p. 19).

- Managerial dynamism, age, education and aspiration levels of management, management attitude towards investment (Parker).[41]

- Need for achievement among the management (Myers and Marquis).[42]

- Operating and organisation pressures, higher management objectives and values (Bela Gold et al.).[43]

- Hierarchy of organisational goals and values, structure of power relationships, status relations; absolute and relative strength by which values and goals are pursued or suppressed (Normann).[44]

- Degree of centralisation, organisation's past experience, needs and requirements of various departments (J. Sheth).[45]

- Individual preferences within the organisation, organisational preferences (Choffray and Lilien).[46]

- Management's broadness of mind and self-confidence (these rather intangible variables have been statistically tested by Peters and Venkatesan).[47]

- Subjective judgments towards risk among the various individuals composing the organisation (Parkinson).[48]
- Characteristics of the decision makers in terms of their risk-taking behaviour, organisational policies for collecting information, degree of orientation towards marketing, organisational climate (these variables were tested as to their correlation with adoption by El-Sherbeny).[49]
- Mechanisms (i.e., local rationality, acceptable level decision rules, sequential attention to goals) used to reduce organisational conflicts about five classes of goals: production, inventory, sales, market, profit (Cyert and March).[50]
- Existing and competing strategies of the organisational actors, as their strategies attach to a set of distinct bounded rationalities (Crozier and Friedberg).[51]
- Corporate 's business environment, values, heroes, rites and rituals (Deal and Kennedy).[52]
- The seven S's (revised McKinsey's "5-S Framework"),i.e., the corporate's strategy, structure , systems, staff, style, skills and superordinate goals (Pascale and Athos).[53] By "superordinate goals" is meant, in McKinsey's jargon, a kind of slogan-like evidence of a paramount belief. For example:

* "IBM means service";
* "Progress is our most important product"
- (General Electric);
* "Better things for better living through
- chemistry" (DuPont);
* "Excellence in underwriting"
(Chubb Insurance)...

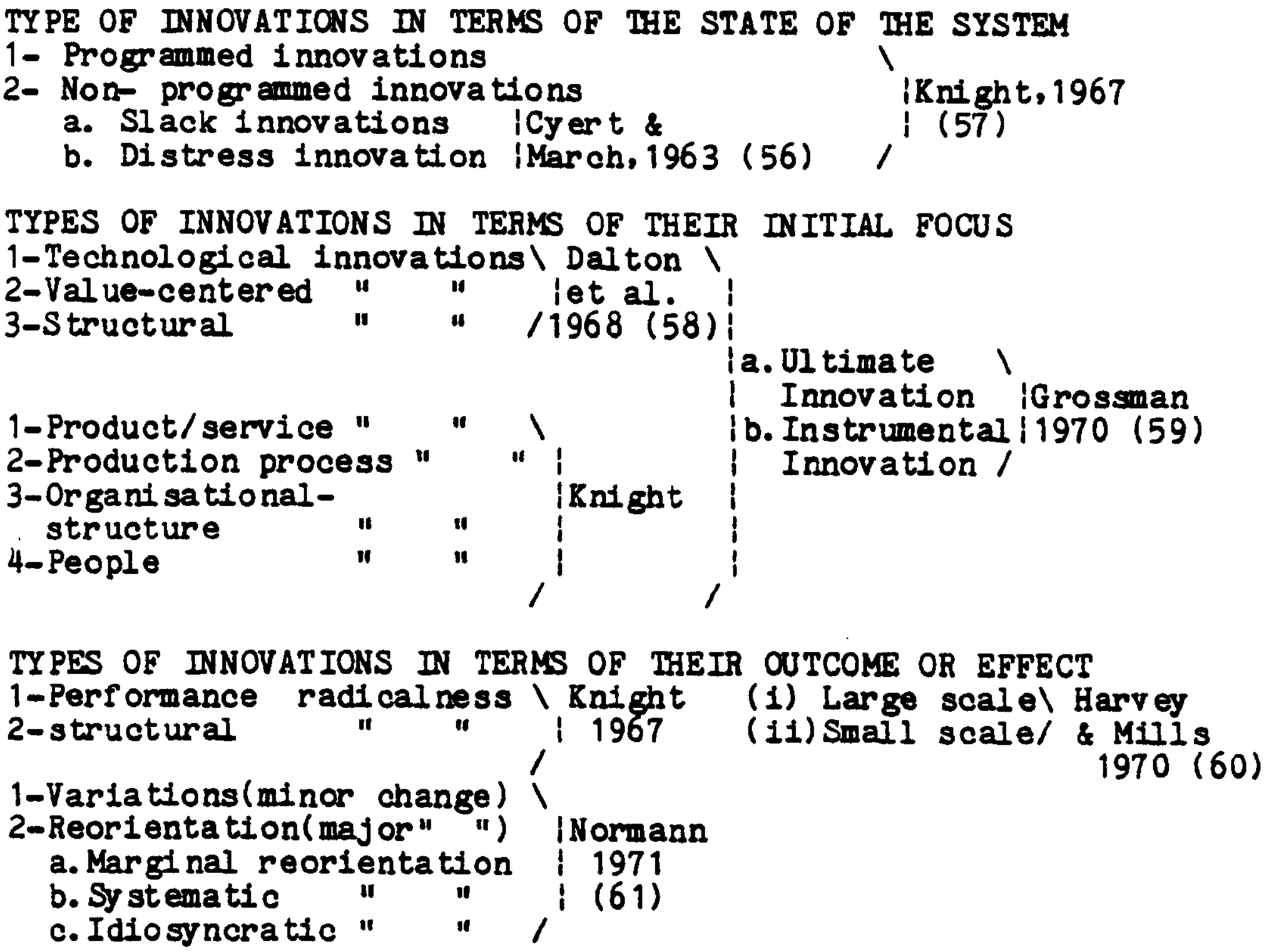
2.3.2. Categorisation of Innovations

Similarly, this categorisation may result from two distincts scopes of reference. The categorisation may refer to the techno-economic attributes of a given innovation system as they constitute an

objective set of measurable data. On the other hand, the categorisation of industrial innovations may be "based on perceived advantages rather than absolute economic advantages" (Baker).[54]

However, the literature suggests various taxonomies, which have been summarised by Zaltman et al.[55] Three major foci are differentiated: the types of innovations in terms of the state of the system (i.e., the organisation); the types of innovations in terms of their initial field of initiation; the types of innovations in terms of their effects (level and degree). Each of these categories gives, in its turn, rise to various clusters, as the following figure indicates.

Fig.5 Other categorisations of innovations
(After Zaltman et al., op.cit., p.31)



Clearly, these taxonomies are aimed at providing a classification scheme that can aid in prediction. For example, Normann's analysis of product development in large companies

supports the claim that there is some utility in distinguishing between innovations along a radical-routine solution continuum. A new product is viewed as a "variation" if its dimensions are basically similar to those of earlier products though with refinements and modifications. On the other hand, "reorientations" imply fundamental changes, in which some product dimensions may be eliminated and entirely new ones added.

What could be the operational implication, from the marketer's viewpoint, of such a distinction? The answer is that, on the assumption that the rate of adoption of the innovation depends upon the degree to which the various subsystems in the relevant organisations should be altered, routine innovations are likely to be adopted earlier than radical innovations.

However, those various types of innovations are not mutually exclusive, although certain combinations are much more likely to come about than others. As Zaltman et al. notice:[62]

> "... programmed innovations are usually routine innovations, whereas non-programmed innovations, particularly the distress variety, often appear as relatively radical innovations because they tend to produce change in the subsystem of the organisation...A non- programmed innovation may also be an ultimate innovation, particularly if a radical situation exists."

In other words, these categories are amenable to a secondary categorisation, depending on the way they are taken into consideration. For instance, the radicalness dimension calls strongly for a subjective appreciation: "radicalness" is neither a physical measure nor an economic concept. On the other hand, distinguishing between "product or service innovations" and "production process innovation" is less liable to subjective interpretation. Here, a pure techno-economic viewpoint is required. The taxonomy adopted in the present research incorporates the classifications mentioned above or, more to the

point, does not ignore them. Further, it avoids the source of ambiguity previously stressed.

2.3.2.1. Techno-Economic Categorisation of Innovations

The categorisation of innovations in an economic and/or technological framework is highly influenced by Rogers' characterisation of new industrial products or processes according to their divisibility, communicability, relative advantage, functional compatibility, and complexity.[63] The divisibility dimension, or ability to implement the innovation on a limited basis, has been distinguished into two sub-dimensions by Coughlan:[64]

(i) First sub-dimension: the extent to which a complete innovation can be implemented without entirely abandoning current practice;

(ii) Second sub-dimension: the extent to which the innovation can be broken down to a set of components that can be implemented gradually with the benefit of feedback.

The complexity dimension refers both to the technologies underlying the innovative process and to the technologies involved in implementing the innovation in a particular context. The functional compatibility concerns what is functionally required of the potential adopters to make use of the innovation; it is related to the similarity of the innovation to an existing product or process it may eventually supplement, complement, or replace. As regards the communicability dimension, it is held that the communicability of an innovation exerts a considerable influence on whether it is accepted or not. This dimension was found to be particularly crucial in the U.S. steel industry.[65] This dimension was found to be also contingent upon the possibility to ascribe or

attribute to the innovation any changes that may occur after the innovation has been introduced.[66] The relative advantage dimension refers to the critical attributes of the innovation, or the function it performs that other alternatives do not.

However, other characteristics have been proposed, as the following lines indicate:

- Triability and observability. In this respect, Rogers and Shoemaker stated that the effect of implementing a given innovation must be amenable to a twofold demonstration: (i) "use-demonstration", or how is the innovation employed and, (ii) "result-demonstration", or what are the benefits of adopting the innovation.[67] It is worth noting that Rogers and Shoemaker acknowledge that such a twofold demonstration is not always feasible.
- Initial and continuous costs, saving of time (resulting from adoption), rate of recovery, pay off, etc. Fliegel et al., in their study of farming enterprises, calculated the coefficient of correlation of each of the above dimensions with the adoption rate.[68]
- Technical applicability, profitability of the new process (Nabseth and Ray).[69]
- Expected value of any proposed change, commercial advantage (Parker).[70]
- Reversibility. Taylor holds that when a number of alternatives are available, the more reversible ones are likely to be adopted earlier; in this sense, the reversibility concept is a function of the degree to which the status quo ante can be reinstalled in the system under consideration.[71]

A twofold piece of criticism has been addressed to this set of characteristics. First of all, their validity itself has been

questioned by various researchers. For instance, Bela Gold argued as follows:[72]

> "... estimates of the differential effects of given innovations on profits are frequently subject to serious error, because most innovations serve as part of larger complexes of facilities whose result cannot be disentangled from one another."

One could reply that it is not because the assessed profitability is frequently "subject to serious error" that managers will not ground decisions upon computations, whatever they may be based on. Terborgh was even more categorical on this issue, since he questioned the possibility itself of such estimations. If he is to be believed:[73]

> "... the overwhelming majority of business investment projects are of this segmental or component type- replacements, improvements, expansions or some combinations there of. Since it is impossible in most cases to compute their separate revenue generation and operating cost incurments after they are in service, it is even more impossible to predict these magnitudes before the projects are acquired."

Nevertheless, should this kind of computation be achievable, somehow or other, another aspect of the categorisation of innovations from their profitability or forecasted advantage remains questionable. As Bela Gold put it, "decision models concerned with the adoption of major technological innovations seem to have succumbed to the temptations both of over generality and over rationality."[74] Moreover, as this author follows,

> "... to say that major innovational decisions are based on profitability expectations adjusted for the estimated probabilities of adverse outcomes may be unobjectionable, and may even be correct in some sense; but it is certainly unenlightening. As an 'explanation' of past decisions, it offers nothing more than a tautology: i.e., if an innovation was adopted, management must have expected it to be sufficiently profitable; and if not, not. And as an empirical 'test' of such expectations, it is hardly more helpful to demonstrate that the innovations which survive and achieve eventually wide diffusion are those whose utilisation has been associated with profitability."

In his Introductory Text to Marketing, Baker criticises the issue even more severely, when he holds that "relative advantage is really a catch-all for the other characteristics."[75]

From what is aforesaid it arises that the most questionable point in the characterisation of innovations from a techno-economic viewpoint seems to be the threat of "over rationality". Obviously, the point is not to advocate irrationality on the part of the various investigators of organisational phenomena influencing the adoption of new technologies (products, processes, systems, etc.). Rather, it is purported to call attention to the misleadingly normative and evaluative connotation attached to the concept of rationality in techno-economic systems. It is in a similar spirit that some may have suggested the advantages of a "technology of foolishness".[76]

More precisely, the point is to underscore the danger of postulating a sole type of rationality on behalf of the potential customers, and of assuming that this rationality is (i) of a techno-economic type only, (ii) shared by any manager in any organisation, and (iii) applied regardless to the specificity of the innovation under consideration.

This postulated rationality results from a combination of the neo-classical economic theory with the new economic theory, or Lancasterian technology of consumption.[77] The question of rationality will be examined in more detail below, and particularly in Chapter V. However, at this stage, a brief overview of the common perspective on rationality may be provided; it is illustrated by Fig.6.

Fig.6- The Postulated types of rationality

Neo-classical economic rationality	Technology of consumption rationality
Principle of preference Principle of favoured abundance, or of non-repletion Principle of utility maximisation Principle of congruity between preference and satisfaction Principle of perfect information Principle of indivisibility	Principle of divisibility Hypothesis of linearity Hypothesis of additivity Hypothesis of objectivity

The principle of preference states that the individual is able to design a function of preference between various goods. The principle of non-repletion implies that a greater quantity is always preferred to a smaller one. The principle of perfect information assumes that the individual has a complete knowledge of his needs and the means to meet them. The principle of indivisibility states that the satisfaction stems from the goods themselves, and not from their characteristics.

According to Lancaster's principle of divisibility, utility does not lie in the goods themselves, but in their characteristics. The linearity and additivity hypotheses express that the quantity of characteristics obtained is in direct relation with the quantity of goods consumed. The objectivity hypothesis states that the goods' characteristics are objectively defined and do not vary from one individual to an other.

This grid is easily applied to organisations; the organisational member replaces the consumer, and is still viewed as homo economicus who, in the name of organisational welfare, assesses rationally the

industrial products, or, most often, their characteristics, and deduces the relative advantage that adoption is likely to entail.

The major piece of criticism that has been addressed to those assumptions is that the first theory supposes perfect rationality and information, while the second, essentially axiomatic, remains poorly explicative and, as a result, weakly operational. For instance, within such a theoretical framework, a given innovation is likely to be accepted if it is relevant to the organisation. But which relevance is to be considered? As Baker stresses it, "the innovation must be relevant in the sense that it performs a function considered as significant in the prospective user's extant or proposed area of activity."[78] This leads one to the second type of categorisation of industrial innovations.

2.3.2.2. Perceptual Categorisation of Innovations

According to Baker, insufficient attention has been given to product characteristics and the user's perception of them.[79] Yet, there may be some distortion between the innovation as defined by the innovator and as perceived by the potential adopters. For instance, consider the perceptual definition of the concept of compatibility as proposed by Rogers and Shoemaker:[80]

> "... the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of the receivers."

Clearly, this perception may differ from the one the innovator could be expecting. Baker and Parkinson stressed this point when they wrote that "the firms' records of an adoption decision tend to reflect the decision-making unit's perception rather than facts themselves."[81] Accordingly, it can be argued that it is the perception of the benefit to be gained through adoption which is

important, as opposed to to any objective statement of it. Expressing a similar opinion, Hagen pointed out that:[82]

> "There is no such a thing as innovation in the abstract. It is always in some specific field, involving specific materials or concepts, or relationships to other persons."

Rogers and Shoemaker have emphasised the subjective dimension necessarily inherent in the adoption process:[83]

> "...[an innovation] is an idea, practice, or subject, perceived as new by the individual, it matters little, as far as human behaviour is concerned, whether or not an idea is 'objectively' new as measured by the lapse of time since its first use or discovery ... If the idea seems new and different to the individual, it is an innovation."

This position is particularly congruent with Peter Drucker's contention that:

> "...what a business thinks it produces is not of first importance ... what the customer thinks he is buying, what he considers 'value' is decisive - it determines what a business is, what it produces and whether it will prosper."

"Managerial attitude", or "attitudinal response" are often reported as a soure of subjectivity in the decision-making process. Baker, in Industrial Buying Behaviour..., emphasises this point, writing that:[84]

> "... 'attitudinal response' (managerial attitude) embraces all those factors which influence the subjective interpretation of the objective 'facts' and is essential if one is to be able to predict how specific firms will react to specific innovations."

Although there are still few studies related to the potential adopters' perception of innovations, the issue of the measurement of managerial attitude has been of major preoccupation for several years. However, managerial attitude cannot be separated from corporate idiosyncracies in general and organisational climnate in particular since, according to Gilmer, the latter can be defined as

those "characteristics that distinguish the organisation from other organisations and that influence the behaviour of people in the organisation".[85] Accordingly, it is of paramount importance to assess the relationships between organisational climate and the perception of the characteristics of the innovation. This gives rise to two major questions:

(i) Which perceptions are relevant, and how can they be assessed?

(ii) Which methodology is the most suitable to relate those perceptions to organisational climate, and how can the latter be determined?

Those two issues clearly afford a great interest, as regards the validity and the generalisability of the empirical findings. A reasonable guide to the logic which the research design should follow is provided by a study of the genealogy of the organisational climate concept. By assessing how the specificity inherent in any organisation has been hitherto treated, sufficient insights should be gained into a methodology capable of ruling out the major threats to a valid conceptualisation of relationships between organisational climate and industrial innovation adoption.

The third chapter of this dissertation is devoted to retracing this genealogy. However, the guidelines of this review revolves around two of the the central concerns of the present research, namely, change and innovation.

Recapitulation

At this recapitulative stage, it should be noted that each dichotomy attached to the categorisations previously addressed refers to rather ideal extremes on the continuum between which lie most of the existing studies. Nevertheless, the compromise between the

extremes (i.e., between a techno-economic categorisation and a perceptual categorisation) most often does not result from deliberate theoretical standpoint, but is rather dictated by the circumstances and the epistemological impossibility of establishing valid knowledge in the narrow neighbourhood of one of the extreme terms of the dichotomy. In other words, the researcher does not enjoy an indefinite degree of freedom in his research. The reseacher's type of study depends - to a great extent - upon the scientific possibility of interpreting the manifold of facts attached to the field of enquiry in economic, technological, behavioural, or perceptual terms.

Consider, for instance, the first categorisation. It is aimed at classifying firms, and it has been proposed that this classification could be achieved either in techno-economic terms or in behavioural ones. The following example indicates how the difficulty to obtain clear and differentiated information through behavioural dimensions impelled the study towards the other pole of the categorisation, namely the techno-economic classification of firms.

In his Economics of Innovation, exciting the reader's interest, Parker announces he will "deal with the identity of the adopters"[86] together with economic characteristics of innovations for, in his judgment:[87]

> "... [the] reaction to innovation will be determined in part by the behavioural characteristics of the potential customers, and in part by the features of the product concerned."

But, as regards the "behavioural characteristics", i.e., "managerial dynamism" as Parker expresses it, the reader might feel somewhat disappointed when the author, with a scientific sincerity which deserves a lot of credit, acknowledges that "summary indications of managerial dynamism are clearly difficult to find"[88]

and is lert surmising that the "ability of companies to perceive and respond to the challenge offered by innovation is likely to be influenced by managerial dynamism". Not surprisingly, Parker's study concentrated on the "economics of innovations".

But this search for "summary indications" of managerial profiles may sometimes be more successful. This can be observed in the study reported by Nabseth and Ray, on the international diffusion of the basic oxygen process in steel making.[89] From the outset, it is postulated that "technological diffusion is related to management attitudes or motives." Then, the researchers' objective is to measure or, failing that, at least identify managerial attitudinal characteristics. In their opinion, "ideally, these data should be generated by predesigned tests that reveal managerial objectives directly", and an appropriate questionnaire should solicit information about staff mobility, educational background, attitudes towards risk, etc.; the answers could have been treated by scalogram analysis or Guttman scaling. But, according to the researchers, the quality of the answers was inadequate to such a treatment. As a result, the investigators were left inferring managerial profiles on the basis of published balance sheets and income statements. Their basic assumption was that managerial policy objectives are revealed by the juxtaposition of certain financial and productivity ratios normally or potentially under management control. These ratios were looked upon as if they were scores obtained from psychometric tests and treated by factor analysis. It seems that this "search for summary indications" results in a rather static description of the firms, for the ratios under consideration only reflect the state of the formal system at a particular point in time and, accordingly, are bound to be poor predictors of the managers' future strategies, yet of paramount importance as regards attitude towards innovations.

Another point remains to be made if the epistemological status of the categorisations mentioned above is to be clearly established. As suggested by Baker, there is a strong indication that, on the grounds of a categorisation of innovations and firms, a given innovator should be able:[90]

> "... to pre-identify the most receptive market segment as a basis for targeting his promotional and selling efforts at this segment. By doing so, one hopes to reduce the elapsed time to first adoption and to initiate the bandwagon or contagion effect, which is characteristic of the diffusion of innovation."

This underlying process has been conceptualised by Rogers and Shoemaker.[91] Their bell-shaped curve of the sales plotted against elapsed time from the introduction of an innovation suggests classifying adopters in five categories (from "innovators" to "laggards") according to the time at which they adopted.

Then the fundamental principle of the preceding argument is that the whole diffusion process, as it is schematised by Rogers and Shoemaker, is amenable to an acceleration corresponding to a translation of the graph from the right to the left, provided an acceleration of the first stage (i.e., adoption of the innovation by the first 2.5% adopters). The coherence and the unity of the total phenomenon over time are based upon an organisational interpretation of both the anthropological tenets of mimetism,[92] and the sociological principle of imitation. According to Baker, the latter principle may be traced back to Gabriel Tarde's The Law of Imitation. Baker grounds his statement upon Tarde's contention that innovations "... show a slow advance in the beginning, followed by rapid and uniformly accelerated progress, followed again by progress that continues to slacken until it finally stops."[93]

3. Conclusion of the Second Chapter

This chapter provided preliminary definitions of some concepts which are central to the research (Section 1). Then, alternative perspectives on the problem were identified (Section 2).

Accordingly, it seems now possible to concentrate on the question of corporate idiosyncracies in more detail. In this respect, the following chapter examines the concept of organisational climate with a view to progressing towards the resolution of the problem characterised in Chapter I.

CHAPTER II

NOTES AND REFERENCES

1- Hutt, M.D., & T.W. Speh. Industrial marketing management. New York, CBS College Publishing, The Dryden Press, 1981, pp. 5-6.

2- Langrish, J., M. Gibbons, W.G. Evans & F.R. Jevons. Wealth from knowledge. London-New York, Macmillan, 1972, p. 7.

3- Tilton, J.E. International diffusion of technology- The case of semi-conductors. Washington, D.C., The Breeking Institution, 1971, p. 4.

4- Steiner, G. The creative organisation. Chicago, University of Chicago Press, 1965.

5- Myers, S., & D.G. Marquis. Successful industrial innovations. National Science Foundation, NSF 69-17, 1969.

6- Linton, R. The study of man. New York, Appleton-Century-Crofts, 1936.

7- Parker, J.E.S. The economics of innovation. The national and multinational enterprise in technological change. London, Longman, 1974.

8- See, for example: Gulfillan, S.C. The sociology of invention. Chicago, University of Chicago Press, 1935.

9- Comte, A. System of positive policy. London, Longman, Green & Co., 1877, vol.IV.

10- Lavoisier, A.L. Traite elementaire de chimie, presente dans un ordre nouveau et d'apres les decouvertes modernes. Paris, Cuchet, 1789, p. 140.

11- Papineau, D. Theory and meaning. Oxford, Clarendon Press, 1979.

12- Twiss, B.C. Managing technological innovation. (second edition) London, Longman, 1980, p.3.

13- Myers, S., & M.G. Marquis. Op.cit., p.1.

14- Zaltman, G., R. Duncan, & J. Holbeck. Innovations and organisations. New York, Wiley-Interscience Publication, 1973, p.10.

15- Baker, M.J. Industrial buying benaviour and the adoption of innovations. In Industrial innovation: technology, policy, diffusion, edited by M.J. Baker. London, Macmillan, 1979, pp. 345-367. See p. 351.

16- Larcon, J.P., & R. Reitter. Structure de pouvoir et identite de l'entreprise. Paris, Nathan, 1979, p. 25. (Quotations from the French are freely translated into English).

17- Carter, D.E. Corporate identity manual. Ashlands, Century Communications Unlimited, 1976.

18- Georgopoulos, B.S. Normative structure variables and organisational climate. Human Relations, vol.18, 1965, pp. 115-170.

19- Litwin, G.H., & R. Stringer. The influence of organisational climate in human motivation. Paper presented at a conference on organisational climate, Foundation for Research on Human Benaviour, Ann Arbor, March 1966.

20- Parker, J.E. Op.cit., p.105.

21- Ibid., p.125

22- Mansfield, E. The speed of response of firms to new techniques. Quarterly Journal of Economics, May 1963.

23- Davies, S. The diffusion of process innovations. Cambridge University Press, 1979, p.6.

24- Baker, M.J. Industrial buying behaviour and the adoption of innovations. Op.cit., p.359.

25- Porter, L.W., & E.E. Lawler. Properties of organisation structure in relation to job attitudes and job behaviour. Psychological Bulletin, vol.64, 1965, pp.23-51.

26- Davies, S. Op.cit., p.160.

27- Parker, J.E. Op.cit., p.105 and 123.

28- Nabseth, L., & G.F. Ray (Editors) Diffusion of new industrial processes - An international study. Cambridge University Press, 1974.

29- Bela Gold, S. Peirce, & G. Rosegger. Diffusion of major technological innovations. In Technological change: economy, management and environment , edited by Bela Gold. Oxford-New York, Pergamon Press Ltd., 1975, pp.129-147. See p.140.

30- Choffray, J.-M., & G. Lilien. Assessing response to industrial marketing strategy. Journal of Marketing, vol.42, April 1978 , pp.20-31.

31- Mansfield, E. The economics of technological change. New-York, Norton, 1968.

32- Schumpeter, J. Business cycles. New York, McGraw-Hill, 1939.

33- D'Arcy W. Thompson. On growth and form. Cambridge University Press, 1942, pp.57 and 1027, inter alia.

34- Haire, Mason. Size, shape and function in industrial organisations. Human Organisations, vol.14(1), 1955, pp.17-22.

35- Baker, M.J. Industrial buying behaviour and the adoption of innovations. Op.cit., p.347.

36- Burns, T. Micro-politics: mechanisms of institutional change. Administrative Science Quarterly, vol.6, 1961, pp.257-281.

37- Burns, T. & G.M. Stalker. The management of innovation.

London, Tavistock, 1961.

38- Carter, C.F., & R. Williams. Industry and technical progress; factors governing the speed of application of science. London, Oxford University Press, 1957, pp.178-183.

39- Morse, J., & J. Lorsch. Beyond theory Y. Harvard Business Review, May-June 1970. Mentioned by Handy, C.B., in Understanding Organisations (second edition). Harmondsworth, Penguin Books, 1981, p.202.

40- Nabseth, L., & G.F. Ray. Op.cit.

41- Parker, J.E. Op.cit., p.113.

42- Myers, S., & D.G. Marquis. Op.cit.

43- Bela Gold et al. Op.cit., p.140.

44- Normann, R. Organisational innovativeness: product variation and reorientation. Administrative Science Quarterly, vol.16(4), 1971, pp.203-215.

45- Sheth, J.N. A model of industrial buying behaviour. Journal of Marketing, vol.37, 1973, pp.50-56.

46- Choffray, J.-M., & G. Lilien. Op.cit.

47- Peters, M.P., & M. Venkatesan. Exploration of variables inherent in adopting an industrial product. Journal of Marketing Research, vol.10, 1973, pp.312-313.

48- Parkinson, S.T. The role of information in the adoption of industrial innovation. M.Sc. thesis, The University of Strathclyde, 1975.

49- El-Sherbeny, A.F.M. Behavioural and organisational influences upon the adoption of industrial products innovation. Ph.D. thesis, The University of Strathclyde, 1978.

50- Cyert, R.M., & J.C. March. A behavioural theory of the firm. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963.

51- Crozier, M., & E. Friedberg. L'acteur et le systeme. Paris, Editions du Seuil, 1977.

52- Deal, T.E., & A.A. Kennedy. Corporate Cultures; the rites and rituals of corporate life. Reading, Mass., Addison-Wesley Publishing Company, 1982.

53- Pascale, R.T., & A.G. Atnos. The art of Japanese management (third edition). New York, Penguin Books, 1983.

54- Baker, M.J. Industrial buying behaviour and the adoption of innovations. Op.cit., p.347.

55- Zaltman et al. Op.cit., p.31.

56- Cyert, R.H., & J.G. March. Op.cit., see pp. 278-279.

57- Knight, K. A descriptive model of the intra-firm innovation process. Journal of Business, vol.40, October 1967, pp.478-496. See p.485.

58- Dalton, G.W., et al. The distribution of authority in formal organisation. Boston, Harvard University Division of Research, 1968.

59- Grossman, J.B. The Suprem Court and social change. American Behavioural Scientist, vol.4, 1970. See p.543.

60- Harvey, E., & R. Mills. Pattern of organisational adaptation: a political perspective. In Power in organisations, edited by Mayer N. Zald. Nashville, Tenn., Vanderbilt University Press, 1970.

61- Normann, R. Organisational innovativeness: product variation and reorientation. Op.cit., p.205.

62- Zaltman et al. Op.cit., p.32.

63- Rogers, E.M. Dirfusion of innovations. New York, The Free Press, 1962.

64- Coughlan, R.J., R.A. Cooke, & L.A. Safer, Jr. An assessment of a survey feedback- Problem solving- Collective decision intervention in schools. Final Report, U.S. Office of Education, Small Grant Division, Area V. Project No. 0-E-105, Contract No. OEG-5-70-0036(509).

65- Czepiel, J.A. The diffusion of major technological innovation in a complex industrial community: an analysis of social processes in the American steel industry. Ph.D. thesis, Northwestern University, 1972.

66- Zaltman et al. Op. cit., p.37.

67- Rogers, E.M., & F. Shoemaker. Communication of innovations: a cross cultural approach (second edition). New York, The Free Press, 1971.

68- Fliegel, F.C., J.E. Kivlin, & G.S. Sekhon. A cross cultural comparison of farmers' perception of innovations as related to adoption behaviour. Rural Sociology, vol.33, December 1968, pp.437-449.

69- Nabseth, L., & G.F Ray. Op.cit.

70- Parker, J.E. Op.cit.

71- Taylor, J. Introducing social innovation. Journal of Applied Behavioural Science, vol.6, 1970, pp.69-77.

72- Bela Gold et al. Op.cit., p.145.

73- Terborgh, G. Business investment policy. Washington, D.C., Machinery and Allied Products Institute, 1978, p.52.

74- Bela Gold et al. Op.cit., p.142.

75- Baker, M.J. Marketing, an introductory text (third edition). London, Macmillan, 1979, p.264.

76- March, J.G. For a technology of foolishness. In Organisations of the future, edited by H. Leavitt, L. Pinfield, & E. Webb. New York, Praeger Publishers, 1974.

77- Lancaster, R. Consumer demand, a new approach. New York-London, Columbia University Press, 1971.

78- Baker, M.J. Industrial buying behaviour. Op.cit., p.349.

79- Ibid., p.364.

80- Rogers, E.M., & F. Shoemaker. Communication of innovations. Op.cit., p.145.

81- Baker, M.J., & S.T. Parkinson. Predicting the diffusion of industrial product innovations. Department of Marketing, University of Strathclyde, Glasgow. 1976, part. 1, section 2, pp.21 and 24.

82- Hagen, C.E. On the theory of social change. Homewood, Ill., Dorsey Press, 1962.

83- Rogers, E.M., & F. Shoemaker. Communication of innovations. Op.cit., p.19.

84- Baker, M.J. Industrial buying behaviour. Op.cit., p.350.

85- Gilmer, B. Industrial psychology (second edition). New York, McGraw - Hill, 1965. (Mentioned by M.J. Baker, in Industrial Buying Behaviour, op.cit., p.351.)

86- Parker, J.E. Op.cit., p.102.

87- Ibid., p.105.

88- Ibid., p.120.

89- Nabseth, L., & G.F. Ray. Op.cit., p.166 et sq.

90- Baker, M.J. Industrial buying behaviour. Op.cit., p.348.

91- Rogers, E.M., & F. Shoemaker. Communication of innovations. Op.cit.

92- See, for example: Harlow, H.F., & C. Mears. The human model: primate perspectives. London, Wiley, 1979.

93- Tarde, G. The laws of imitation. New York, Henry Holt & Co., 1903. (Quoted by M.J. Baker in Industrial buying behaviour, op.cit.).

CHAPTER III

FIRST HEMISPHERE: THE PUTATIVE THEORY OF ORGANISATIONAL CLIMATE

0. Introduction

Chapter II was devoted to providing an overview of the major dimensions of this research, namely organisational climate (as a set of non-strictly techno-economic corporate idiosyncracies) and technological innovation. The present chapter concentrates on the organisational climate concept, and is aimed at assessing in an operational perspective the epistemological status of the approach this notion gives rise to.

According to Karl Popper, "what compels the theorist to search for a better theory is... almost always the experimental falsification of a theory."[1] From what has been considered in Chapter II, it follows that the classical techno-economic approach to organisations fails to account entirely for the innovation adoption process. The investigator is left either surmising the existence of "contextual" idiosyncracies influencing and affecting the decision-making process or resorting to meta-economic dimensions (e.g., in Parker's terms, "managerial dynamism") which his conceptual tools prove unable to handle, let alone measure.[2] On the other hand, attempts to treat those meta-economic dimensions through techno-economic inferences are worked out at the expense of a dynamic assessment of the situation (as in Nabseth and Ray's research).[3]

Then, if a "theory is a tool which we test by applying it, and which we judge as to its fitness by the results of its

applications,"[4] the techno-economic interpretation of the adoption of industrial innovations does not give rise to an unquestionable validity. From the aforesaid, it follows that the heuristic function and, therefore, the epistemological status, of the organisational climate approach could be to complete, rather than to compete with, the techno-economic interpretation, by reducing the unexplained variance in the sequence in which firms adopt industrial innovations. Then, the question arises of the extent to which the organisational climate approach constitutes a theory, insofar as the literature bears reference to the "organisational theory", or to the "firm theory". According to Karl Popper, two dimensions are necessary to any theory:

(i) Universal statements, i.e., hypotheses of the character of laws;

(ii) Singular statements, which apply to specific events, or initial conditions. It is from the conjunction of universal statements with initial conditions that predictive singular statements can be deduced.[5]

In the absence of any certitude that the organisational climate approach is amenable to such a format, nothing can be stated but the supposed, or putative, theoretical status of this interpretation. This chapter is aimed at determining the extent to which the organisational climate approach could stand as something more than a putative theory. To answer this question, it is necessary (i) to examine the origin of the organisational climate concept and demarcate the body of research which could furnish its broad theoretical basis ("genealogy" question) and (ii) to examine how the concept is used in the literature ("praxiology" question). These issues are respectively treated in Section 1 and Section 2. Section 3 concludes on the epistemological question.

CHAPTER III

SECTION 1 GENEALOGY: GENESIS OF THE CONCEPT THROUGH THE ORGANISATIONAL LITERATURE

It has already been set forward that the organisational climate approach, within the scope of the present research, is aimed at reducing, in the industrial innovation adoption sequence, the variance left unexplained by the techno-economic approach. Accordingly, a reasonable way to increase the ratio of explained variance is to consider other factors than those which are associated with the variance already explained, or to assess them from a different point of view. This section is devoted to reviewing the various ways in which non-strictly techno-economic organisational idiosyncracies have been treated so far. In parallel, each approach will be assessed as to its ability to furnish the theoretical background of the present research. The review boils down to two major sub-sections dealing with the prevailing interpretative standpoint of the schools considered (positivistic/non-positivistic); in turn, the first sub-section gives rise to a secondary distinction according to the type of reflection involved (a priori/non-a priori).

1.1. Positivistic Theories

1.1.1. A Priori Approaches

1.1.1.1. The Classical Doctrine

"Up until the 60's, researchers were mainly concerned with solving organisational problems with universal solutions. They used to ignore organisational specificities."[6] This is particularly obvious as regards the great ancestors: Taylor and Fayol, who posited

considerable tenets about work organisation and control, but advocated a uniform type for the latter regardless of any corporate idiosyncracies.

In essence, tne "classical doctrine deals almost exclusively with the anatomy of formal organisation."[7] Its tenets, specified in 1947 by Weber, provide an ideal (i.e., non-empirical) typology of the bureaucratic model of organisation.[8] According to Weber, the bureaucratic type of organisation is "capable of attaining the highest degree of efficiency and is, in this, the most rational known means of carrying out imperative control over human beings."[9] This control, and the resulting expected efficiency, revolve around five major concepts:[10]

(i) Division of labour;
(ii) Continuity and uniformity of operations;
(iii) Neutrality of action;
(iv) Hierarchy of authority;
(v) Task definition.

With respect to the general concern which governs this research, this "monocratic conception", as Thompson labelled it, lacks mechanisms for dealing with conflicts, overemphasises certainty and the technocratic rationality (cf., the classical "one best way").[11] Because various studies, among others by Burns and Stalker[12] or Lynton,[13] to take the most famous, have pointed out that an important characteristic of the innovation process in organisations is dealing with conflicts, the classical approach does not seem suitable to the present research. A similar conclusion follows as regards the concept of certainty. As Zaltman et al. note, "bureaucratic organisations operate on this presumption of certainty in the decision environment".[14] But the rule that "organisational decision makers... [know] what they are looking for" is less

applicable "in innovation situations because decision makers are often less sure about exactly what they need".[15] Accordingly, the Classical Doctrine is not congruent with the study of the idiosyncratic ways in which different organisations may deal with uncertainty, conflicts and change.

1.1.1.2. The Neo-Classical Theory of Organisation

Commonly equated with the "Human Relation Movement", this school was thriving in the U.S.A. after the second world war, and aimed at reducing the shortcomings inherent in the mechanistic viewpoint inherited from the Classical Doctrine.[16] Emphasising the individual and small groups' role, this movement devotes its researches to investigating and identifying relationships between the firm's productivity and its employees' satisfaction. It is worth noticing that studies carried out by the neo-classical theorists of organisations are of particular interest to the present issue: as the survival of the informal organisation requires stable continuing relationships among the people, it has been observed that the informal organisation resists change.[17]

Briefly, the Neo-Classical Theory of organisation accepts the postulates of the Classical Doctrine, regarding the pillars of the organisation as given. However, these postulates are considered as modified by people, acting independently or within the idiosyncratic context of the informal organisation (this term refers to people in group associations at work, but these associations are not specified in the "blue print" of the formal organisation). It has been suggested that the inspiration of the Neo-Classical Theory could be traced back to the Hawthorne Studies.[18] Despite valuable contribution to the lore of the specificity inherent in the organisational phenomenon, "like the Classical Doctrine, the Neo-

Classical Theory suffers from incompletness, a shortsighted perspective, and a lack of integration among the various facets of human benaviour studied by it."[19] Thus, although this theory refers to the "interactional climate" in organisations, its major propositions were not to give rise to an operational approach to the organisational climate phenomenon. More to the point, as stressed by Larcon and Reitter, this school, unfolding a normative methodology, tends to advocate absolute tenets such as "democratic style of leadership", "collective decision-making", etc., which limits its ability to carry out researches on the various idiosyncratic aspects of any organisation.[20] In other words, the Neo-Classical Theory's categories are too prescriptive (cf., Likert's "system 4") to allow for a study of organisational climate.

1.1.1.3. The Analytico-Ethnological Approach

This approach deals only with singular corporate cases, and exclusively focuses on analysing organisations'internal processes.[21] However, through the investigation of the dependence between the technological, economic and social constraints resulting from the environment and the organisation, this school resorts to a deterministic approach that does not pay enough attention to the autonomy of the actors in the firm, which is of paramount importance when studying decision-making processes.

1.1.1.4. The Cybernetic Conception of Organisations

This approach proved useful in understanding the role of the structures in the organisations under consideration, particularly through the study of information and communication.[22] This school holds that a social system can be described as a set of elements

coordinated by intercommunications and information:[23]

> "The essential point here is that although the relations among components of mechanical systems are a function primarily of spatial and temporal considerations and the transmission of energy from one component to another, the interrelations among components in complex organisations depend more and more on the transmission of information."

This type of analysis enables the various organisations to be differentiated: each organisation is a specific system. This approach is neither deterministic nor normative: it holds that the point at issue is not to define norms, but to describe a set governed by idiosyncratic laws (which are to be identified), and which manifests an original type of relationship with its environment. However, this approach suffers from two major shortcomings, which are pointed out by more recent schools (see 1.2.1.):

(i) It ignores the political aspect inherent in any human system: the model is a regulated system operating in a field of which the fluidity and transparency are postulated.

(ii) It ignores the strategic dimension of human action within the organisation: it neglects the elements of the system's ability to use information as a source of power, to achieve micro-strategy. A regulated system implies the neutrality of information.

In conclusion, this conception bears the hallmark of functionalism. As noticed by Crozier and Friedberg, this school's positivistic rationalism postulates a priory some type of rationality on the part of the system's elements and resorts to a normative-deductive logic: the system is viewed as being regulated by a central regulator independent from human interactions.[24] The major piece of criticism that has been addressed to this approach is closely related to this research concern, and is based on the

concept of strategy. As expressed by Crozier and Friedberg:[25]

> "... the model underlying the cybernetic analogy is a model which neglects the strategic (i.e., irreducibly unforeseeable) dimension of human behaviour, a dimension which renders impossible any regulating mechanism based on a direct command of the regulated phenomenon, here human behaviour."

Recapitulation of the Positivistic-A Priori approaches

The approaches mentioned above are positivistic inasmuch as:

(i) They ignore the political (i.e., power-related) dimension of organisations, and the fact that the freedom of their elements manifests itself through various strategies;
(ii) They resort to deterministic postulates;
(iii) They are reductionnist, since they interpret human collective action through reductions such as the Taylorian "homo economicus".

Further, tney are a priori approaches inasmuch as :

(i) They postulate a priori an economic rationality on the part of the people in the organisation;
(ii) They incline to interpret the complexity of human behaviour using a priori models such as Maslow's motivational hierarchy.

Then, as Crozier and Friedberg noticed, this conception implies normative assessments:[26]

(i) There must be a "fit" between organisational structures and the psychological needs of individuals, which are considered as mutually independent variables (Human Relation Movement);[27]

(ii) Or it is required that the system be both flexible and stable (Cybernetic Conception of Organisations).

These a priori requirements render this first type of approach inappropriate to provide the theoretical background of the present research.

1.1.2. Non-A Priori Approaches

1.1.2.1. The Structural Analysis of Organisations and the Contingency Theory of Organisation

This trend has developed essentially in Great Britain and in the United States, with, as main forum, the "Administrative Science Quarterly Review", published at Cornell University. Its most famous vectors are (or were), in the U.K., Burns, Pugh, Hickson, Woodward, and, in the U.S.A., Blau, Hage and Aiken, Hall, Lawrence and Lorsch.[28] The movement, in essence, holds that each organisation is specific. Idiosyncracies appear clearly through the organisation's structures and particular operating rules. Then, there is no "one best way" to deal with problems within the firm. However, this theory 's closeness to the problem under consideration calls for considered attention. Three of its major aspects will be examined in the light of Crozier's approach to organised action.

1.1.2.1.1. Technology and Technological Determinism

Among all the "contextual idiosyncracies" (such as the organisation's origin or history, its size, technology, location, etc.), technology was the first characteristic to be deeply and empirically studied through a pioneer research carried out by Joan Woodward.[29] The research was based on a very large and complete

sample of Essex industrial companies, and was aimed at assessing the influence of technology upon the companies' organisational structures and performance. Harvey has reproached Woodward's conceptualisation of technology with various shortcomings. For example, according to this author, Woodward neglected the very task contents as well as the shifts in products that may occur within a given technology.[30] More recently, Crozier and Friedberg stressed the "dangers of technological determinism to which could give rise an over simple interpretation of Woodward's results, i.e., the idea that the technological requirements, via the performance constraints, determine the organisational structures."[31] However, the notion of "technological imperialism" has been first criticised by D.J. Hickson et al., on the ground that marked structural variations within one and the same technological category are widely observed;[32] further, in Woodward's sample itself, numerous companies can be pointed out, which, in spite of performance rates below the average in their category, remain in activity and keep their a-typical structures.

Despite an essentially theoretical and non-empirical orientation, various works due to Perrow adopt a similar perspective, although his more sociological approach was aimed at furnishing a comparative framework for studying organisations.[33] This framework builds on a typology of the relationships between the techniques of production and the operating structures within organisations. However, by defining technology as a set of dimensions implicitly considered as objective facts to which the organisational factors cannot but adapt, such a model takes as solved the very problem under consideration: why, how, and to what extent technological characteristics are experienced as constraints by the organisational actors and, conversely, to what extent those actors can use the constraints in their own strategies. As a

result, Perrow was induced to integrate change into his analysis via a general and highly hypothetic postulate. This postulate assumes that: (i) in the interest of efficiency, organisations, wittingly or unwittingly, attempt to maximise the congruence between their technology and their structures; (ii) "organisations have all studied the sociology of complex organisations" and have adapted their structures to fit their technology.[34] Finally, according to Argyris, this approach resorts to reification when it refers to the deus ex machina of the "wills" and the "needs" of the organisations.[35]

1.1.2.1.2. Organisational Context and Multivariate Determinism

The influence of other idiosyncratic contextual factors (organisational size particularly) stands at the centre of Blau, Hall, Pugh and Hickson's works. On the basis of quantitative studies on all the U.S. employment agencies, Blau aims at determining a formal and deductive theory of the organisation's structural differentiation, within a spatial, functional, hierarchical and occupational scope. His conclusions can be summarised as follows: the larger the organisational size, the more accurate the structural differentiation, but with a decreasing intensity and effect of the law.[36] In their research on a sample of Midlands work organisations, Pugh, and Hickson et al. refuse to confer such a central role to organisational size. Criticising what they label as a unidimensional approach leading to privilege a priori a single contextual variable (technology, size, goals, etc.) they advocate a multidimensional approach, in order to encompass the context's influence on the organisational structures. Seven contextual factors were taken into consideration and used as independent variables in a multivariate regression analysis. The

objective was to predict three major structural dimensions previously assessed by an empirical research: activity organisation, authority concentration, line-control of workflow.[37] On the grounds of this research result, the authors concluded that organisational structure is an essentially multidimensional phenomenon and that, accordingly, a unitary concept like bureaucracy, for instance, proves of very limited interest, since the organisational structures may vary on each of the three major dimensions.[38]

However, multivariate as they be, those studies are bound to be partial. Their results suffer from shortcomings inherent in the statistical methodology which is used: a non-negligible fraction of the total variance remains unexplained by the model. The formalistic nature of these studies is questioned by Crozier and Friedberg:[39]

> "... being content with articulating statistical correlations between structural and organisational variables within formal models of structural evolution in organisations, those researches consider organisational structures...as the sole mediation between the 'context' and the organisation's performances, they attribute to those formal characteristics a privileged, if not exclusive, explicative value."

In fact, what Crozier and Friedberg question is the quantification of the structural variables: they hold that the difficulty of achieving such a quantification leads to reductionism. There seems to be a crucial point that Crozier and Friedberg have overlooked in their analysis: the limits mathematically ascribed to a model do not impair its logical value. Invalidity may arise when, and only when, one tries to operate the model beyond these mathematical limits (generally confidence intervals, level of significance,...). Moreover, and particularly in Pugh's works, the basic theoretical propositions are somewhat more elaborated and differentiated than Crozier's reproach for reductionism tends to

suggest.

On the other hand, what those results indisputably suggest is that the unexplained variance is liable to a non-quantitative appraisal or, at least, that quantitative approaches are not entirely successful in their assessment of organisational idiosyncracies, as these may be related to exo- or endo-characteristics.

1.1.2.1.3. External Constraints and Adaptation to Environmental Requirements

The patterns of adjustment which take place between the organisational structures and the environmental requirements constitute the main focus of the researches which are reviewed in the following lines.

In one of the first investigations concerned with such problems, Burns and Stalker concentrate on the degree of adaptation of more or less bureaucratic organisational structures to varying states of their economic or social environment.[40] Based on the study of twenty British companies, their research gives rise to two ideal-typical organisational models, each of them being adapted to a particular state of the economic and social environment: the mechanistic model (strict hierarchy, vertical communication, rigidly defined tasks, specialisation of tasks...) and the organic model (fluidity of tasks, lateral communication, decentralisation). The former is considered as efficient when technology does not change, while the latter is advocated when the firm is faced by changing environment.

Following a similar methodology, Emery and Trist pointed out causal inter-relationships in the environment.[41] From a different starting point, Lawrence and Lorsch came to analogous conclusions:

there exists a fundamental relationship between (i) external variables (uncertainty, diversity of the environmental constraints), (ii) internal states of integration and differentiation, and (iii) conflict solving procedures.[42] The more the organisational structures and procedures take into account this relationship, the better the organisational performance. This approach is not an a priori one, since it does not advocate any one best way: the most suitable degree of integration and differentiation is contingent (the term of "structural contingency" is due to Lawrence and Lorsch) upon the environmental characteristics.

However, in an article published in 1972, Child criticises this conception of the environment as a set of impersonal and objective factors which unilaterally affects organisations.[43] According to Child, environment is not univocal. It involves ambiguous and changing requirements, which may be divergent, if not contradictory. From this results a source of indetermination, which gives rise to alternative choices and freedom in the relationships between the organisation and its environment. In other words, the environmental requirements are not "disincarnated" factors. They are experienced as constraints by the organisational actors through their actions and choices. This point will be studied at length below.

Recapitulation on the Contingency Theory of Organisation

The contingency theory of organisation is not an a priori approach. The researchers whose works were examined above are not content with applying a priori tenets. On the contrary, they resort to an empirical assessment of the firm's situation in order to identify the requirements the firm is to meet, the problems which are to be solved by developing efficient (i.e., "congruent") organisational

structures. However, to what extent is this approach capable of giving rise to an operational assessment of the firm's idiosyncracies and its probable response to environmental change (including industrial innovation)? Two major elements limit the practical relevance of this approach to the topic of the present research:

(i) Static appraisal: the almost exclusive attention to formal characteristics results in a static description of the organisational phenomenon while change is reduced to a quasi-mechanical process of unilateral adjustment of the structures to the environment.

(ii) Strategy overlooking: considering organisational structures as the sole mediation between the "contextual variables" and "organisational performance" results in neglecting inner strategic influences such as the "prevailing coalitions" described by Cyert and March.[44] Conceptualising an operational interface between corporate idiosyncracies (inasmuch as they constitute the organisation's climate) and the adoption of new industrial products or processes calls for a deeper attention to individual strategies in the organisation.

Taking into consideration the strategic side of the organisation is the main concern of the school examined in the next sub-section.

1.1.2.2. The Corporate Development Model

This trend dates back to Chandler's study of four large American firms (Du Pont de Nemours, General Motors, Standard Oil New-Jersey, and Sears Roebuck).[45] As he was concerned with describing the

relationships between these companies' strategies and their structures, he found that the structure seemed to stem from the strategy: the structure looked as though it adapted to strategies. However, it is to be noticed that "strategy", in this context, is understood at the company level, rather than at the individual level.

A body of researches carried out at Harvard University and in Europe has helped to conceptualise this proposition and suggests a model of corporate development.[46] More recently, a study conducted in Great Britain on forty-eight firms pointed out a correlation of 0.36 between the extent of diversification in the firm's strategy and the divisionalisation of structures. This value, though not large, remained essentially the same when a number of other factors were controlled: it does not appear to be attributable to any third variable.[47]

This approach is not an a priori one, since it does not postulate any given type of strategy on the part of the organisations under consideration. Nevertheless, this movement should be related to positivistic doctrines, since it sets forward a threefold development model very akin, in its essence, to Auguste Comte's "law of the three states":[48] after the entrepreneurial initial stage, the firm will go through a second phase, corresponding to a specialised structure and, eventually, at the third stage, the firm is compelled (or impelled) to diversify its structure.

However, this school has contributed to widening the scope of the non-positivistic approaches, to an assessment of which the next part of this section is devoted.

1.2. Non-Positivistic Theories

1.2.1. The Strategic Theory of Organised Action

The epistemological background of this theory must be related back to the works of March and Simon,[49] Allison[50] and Lindblom[51] on rationalities and strategies. Based on the seminal concept of "bounded rationality" and the contention that an organisation cannot totally repress any of its elements, this theory's basic tenet is the following:[52]

> "If one admits that, within any organisation, the individual actor enjoys an irreducible degree of freedom, then there is no understanding his or her empirically observable behaviour through the sole rationality of the organisational objectives, functions and stuctures, as though those were given circumstances to which the individual could not but adapt."

This statement that any organisational actor's degree of freedom is irreducible to zero is grounded on the contention that any actor can always use his faculty of retention of information and, thus, command a critical zone of uncertainty for the other actors. Then, any actor is apportionated a particular amount of power, in relation with the relevance of the information he detains. In turn, this power is used to achieve the actor's strategy in the organisation. Nevertheless, it is held that each strategy cannot be understood with the sole reference to the past behaviour of the corresponding actor. According to this theory, any strategy must be interpreted in relation to a particular rationality, bounded by its level of information.

Briefly, rationalities are considered at the individual or small group level and each rationality consists of a particular set of criteria to relate means to ends. Then, each rationality attaches to a particular strategy, or network of means and ends. These ends are company related but may be different from the "organisational goals".

Despite the major twofold contention, this approach is neither a positivistic nor an a priori one. Indeed, no particular strategy is postulated on the part of the actors: they use their irreducible degree of freedom to implement means-ends series whose terms are not predetermined by the theory.

1.2.2. The Phenomenological Approach to Organisational Sociology

This approach results from Schütz's synthesis[53] of the theses held by Weber[54] and Husserl[55] and has given rise to an important body of research[56]. Basically, this approach holds that:

(i) The organisational actor's behaviour is always meaningful, although the researcher may find it difficult to relate this behaviour to "rational objectives";

(ii) The actor's behaviour is to be interpreted in the light of his consciousness, as this behaviour attaches to the subject's perceptions, "protentions", projects and intentions.

Phenomenology is then defined as a perspective of gaining knowledge of reality by focusing on an individual's subjective experience at the individual or at the social level.[57] As far as methodology is concerned, the use of the spoken, articulated, consciousness experience stands as the raw data of the phenomenologist. This school acknowledges that notions such as consciousness, motivation, attitude, etc., are all unobservable. But it is held that these notions are embedded in language which the researcher has to examine and look into until he grasps the subjective or social reality they contain. Clearly, this approach has nothing to do with positivism. Positivism studies and generally quantifies the relationships between things postulated as being located out there, posited out there, or between a subject and

an object outside himself. Moreover, by definition, the phenomenological approach is opposed to a priori propositions. Indisputably, by enabling the researcher to focus on the organisational actor's perceptions as they relate to his behaviour, this approach proves to be particularly congruent with the special concern of this research. At this stage of the analysis, a brief recapitulation can be provided.

1.3. Intermediate Recapitulation

First, to draw relationships between non-strictly techno-economic corporate idiosyncracies and industrial innovation acceptance, Professor Baker's proposition that the adoption of a new technological product or process is strongly influenced by the subjective perception of the decision-makers has been accepted (Chapter II). Second, the suggestion that the actors' perceptions are associated with the idiosyncracies of the organisation they belong to, as the set of these idiosyncracies could be denoted by the concept of "organisational climate", has been also accepted. Third, the main organisational theories have been reviewed. The point at issue was not to set forward value judgments. Indeed, a-priorism or positivism are not drawbacks in themselves. What matters is the congruence between these approaches and the problem under consideration. When studying change, a-priorism is likely to impair one's judgment. On the other hand, positivistic postulates are inadequate when dealing with subjective (i.e., experienced by a subject) notions. As a result, two approaches prove particularly capable of furnishing a suitable conceptual framework for the present research:

(i) The Strategic Theory of Organised Action, for it enables a

dynamic characterisation of the firm through the study of the firm's competing rationalities as they attach to particular strategies.

(ii) The Phenomenological Approach to Organisational Sociology, for it enables the researcher to relate rationalities and strategies within the firm to the organisational actors' perceptions and decisions.

SECTION 2 PRAXIOLOGY: PARADIGM AND ASSESSMENT OF ORGANISATIONAL CLIMATE

This section is concerned with the "practice" (or praxis) of organisational climate studies. The questions to answer are: How is the concept defined?; What does organisational climate consist of (according to organisational theorists)?; How is it assessed? In short, this section deals with the various attempts which have been made in order to understand organisational climate and assess its influence on organisational phenomena.

However, a closely related notion must be examined first, in order to avoid confusion. This is dealt with in the following sub-section.

2.1. A Closely Related Notion : Organisational Culture

Smircich has recently pointed out the intersection of "culture theory" and organisational theory.[58] According to Smircich, this intersection appears through five current research themes : comparative management, organisational cognition, corporate culture, organisational symbolism, and unconscious processes in organisations.

Researchers pursue these themes for different purposes and their

works are based on different assumptions about the nature of culture and organisation. Indisputably, researchers are more and more linking the concept of culture with the study of organisations. As the symbolic aspects of organised settings were increasingly recognised, calls for a cultural perspective on organisation developed.[59]

This trend is particularly obvious in Turner's works[60] and in more recent contributions by Pettigrew,[61] or Whorton and Worthley[62]. Peters[63] and Pfeffer,[64] among others, have recently treated management as a symbolic activity.

On the other hand, Dandridge,[65] Wilkins and Martin,[66] Martin and Powers[67] or Trice and Beyer,[68] inter alia, have enhanced the power of organisational symbolism, legends, stories, myths and ceremonies (see 2.1.2.).

The general concept of organisational culture is widely referred to in the literature, and it would be somewhat pointless to review at length what is already available in textbooks. Consequently, the sub-section below (2.1.1.) provides a summary of the classical classification of organisational culture, before concentrating (in 2.1.2.) on more recent propositions in the consulting world.

2.1.1. The Classical Classification of Organisational Cultures

Built on the definition of organisational culture as a combination of "deep-set beliefs about the way work should be organised, the way authority should be exercised, people rewarded, people controlled", four categories are commonly distinguished.[69]

The following figure provides a summary of their main features.

Fig.7- Four types of organisational cultures

Type	Organi-sation	Key Concept	Influence Source	Excels in	Short-comings
Power culture	Entre-preneurial organi-sation	Central power source	Bargaining	Quick reactions	Does not adapt to growing size
Role culture	Bureau-cracy	Job description	Procedures	Stable environment	Does not adapt to unstable environment
Task culture	Matrix organi-sation	Project	Expertise	Flexible adaptation	Control is difficult
Per-sonal culture	Community	Individual	Mutual consent	Serving people with same interests	Coercion is difficult

From a marketing viewpoint, this "segmentation" is mainly useful in categorising decision-making processes within the potential adopters' organisations. However, such a classification has been worked out in more detail in modern decision-making theories, which will be reviewed in due course.

2.1.2. A Consulting Approach to Organisational Culture

Within the scope of these researches, the usual term is, not surprisingly, "corporate culture", as opposed to "organisational culture". This type of study is termed a "consulting" approach because its defenders, most of whom are consultants, are concerned with providing advice in terms of managing corporate cultures, that is, in their own words, "to understand them, shape them, and retool them when change is necessary."[70] Deal and Kennedy's study originated as they became convinced that firms' structures and strategies are more symbolic than substantive.[71] As an exploratory research, Deal and Kennedy (respectively from Harvard's

Graduate School and McKinsey & Co.) asked the following questions to McKinsey's consultants about companies they knew on a first hand basis:

(i) Does Company X have one or more visible beliefs?
(ii) If so, what are they?
(iii) Do people in the organisation know these beliefs? If so, who? And how many?
(iv) How do these beliefs affect day-to-day business?
(v) How are the beliefs communicated to the organisation?
(vi) Are the beliefs reinforced by formal personnel processes, recognition, rewards?
(vii) How would you characterise the performance of the company?

Over a period of about six months, they developed a characterisation of nearly eighty firms. They found out that:

(i) Of all the companies surveyed, only one third (twenty-five) had clearly articulated beliefs;
(ii) Of this third, two thirds had qualitative beliefs, or values, such as "IBM means services"; the remaining third had financially oriented goals that were widely understood.
(iii) Of the eighteen companies with qualitative beliefs, all were "uniformly outstanding performers", while the other companies had their "ups and downs". The consistently high performers were characterised as strong culture companies.[72]

It is worth noting that Kennedy and Deal, in a rather normative way, consider that a corporate culture embodies what it takes to succeed in the broader social and business environment in which the company operates.[73]

Analytically, corporate culture is viewed as resulting from five elements:

(i) Business environment;

(ii) Values, which define success in concrete terms for employees, and establish standards of achievement within the organisation;

(iii) Heroes, who provide tangible role models for employees to follow;

(iv) Rites and rituals, which are the systematic and programmed routines of day-to-day life in the company;

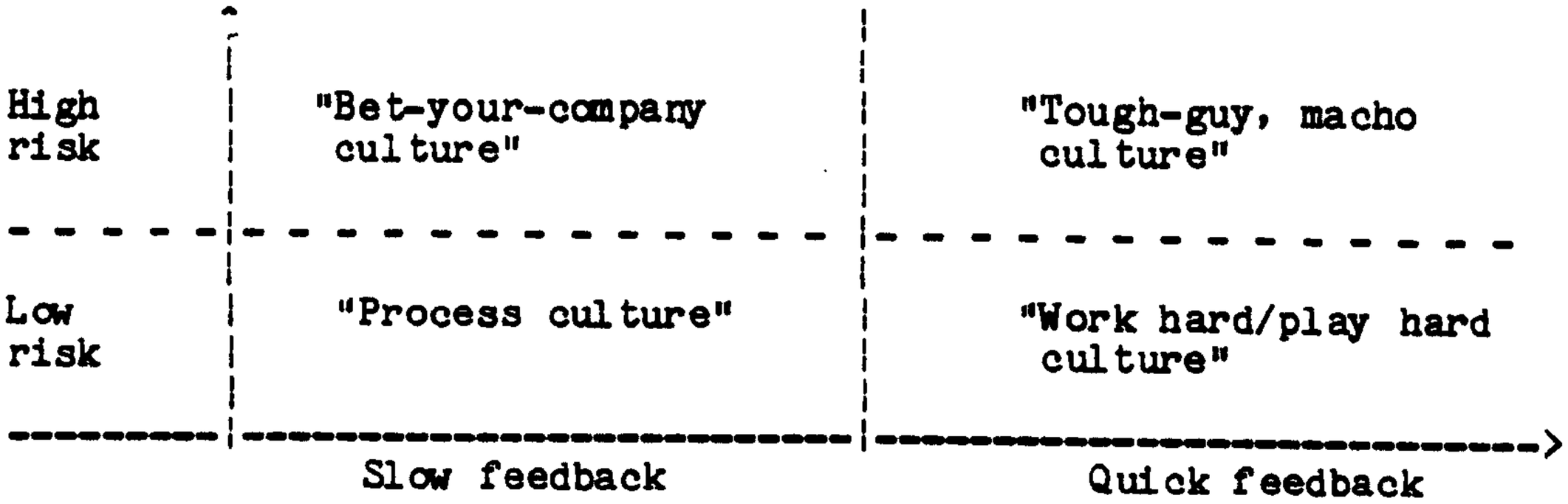
(v) Cultural network which, as the primary means of communication within the firm, is the "carrier" of corporate values and heroic mythology.[74]

Then, Deal and Kennedy applied this framework to an extensive sample of corporations they had known either through consulting activities or report studies.

Their conclusions were that "many companies fall into four general categories or types of cultures."[75] These categories stem from two factors in the market place: the degree of risk associated with the company's activities, and the speed at which companies - and their employees - get feedback on whether decisions or strategies were successful.

From these "market realities" (as these researchers have it), four generic cultures are distilled, which may be illustrated by the following diagram.

Fig.8- Four types of corporate cultures



Deal and Kennedy defines these cultures as follows:

(i) The "tough-guy, macho culture": a world of individualists who regularly take high risks and get quick feedback on whether their actions were right or wrong.

(ii) The "work hard/play hard culture": fun and action are the rule here, and employees take few risks, all with quick feedbacks; to succeed, the culture encourages them to maintain a high level of relatively low risk activity.

(iii) The "bet-your-company culture": refers to cultures with big-stakes decisions, where years pass before employees know whether decisions have paid off. They operate in a high risk, slow feedback environment.

(iv) The "process culture": a world of little or no feedback where employees find it hard to measure what they do; instead they concentrate on how it is done.

Then, beyond a colourful taxonomy, what is the contribution of this research ? This approach seems to bear the hallmark of the consultancy (more to the point, the McKinsey) syndrome. Indisputably, from the marketer's viewpoint, Deal and Kennedy's survey suffers from a normative appraisal. Advocating "strong culture" in corporations provides poor help in marketing products. Obviously, this was not the authors' objective. In short, their

approach is aimed at furnishing managers with a technology of organisational culture control. This becomes clear as the authors express a tenet such as:[76]

> "...a strong culture is a powerful lever for guiding behavior...A strong culture enables people to feel better about what they do, so they are more likely to work harder."

This argument points out the differences between organisational climate and corporate culture approaches.

Firstly, the prescriptive corporate culture approach implies a one-way relationship between cultures' elements (norms, values, etc.) and the people in the organisation. A change in the culture should entail a change in the employees' behaviour. In fact, as noticed by Smircich, consistent with the framework of the system theory, this research conceives of an organisation as existing in a largely determinant relationship with its environment.[77] It is held that the environment presents imperatives for behaviour that managers may enact in their organisation through symbolic means.[78]

As it is argued in Deal and Kennedy's work - but this appears as well in Peters and Waterman's now famous publication,[79] organisations with "strong" cultures are apt to be more successful. The underlying assumption is that the symbolic or cultural dimension in some way contributes to the overall systemic balance and effectiveness of an organisation.[80]

Actually, the concept of "culture management" clearly suggests that most of the corporate culture's elements are under management's control. As will be indicated later, organisational climate is viewed as a set of organisational idiosyncracies less likely to be "handled".

Secondly, the corporate culture approach considers culture as existing out with the people in the organisation. This conception is opposed by a strenthening stream in the organisational climate

literature.

However, corporate culture classifications could be used as a basis for micro-segmentation. But categories such as the four proposed by Deal and Kennedy are too broad to enable an operational segmentation of the potential customers. Generally, innovators do not need further study to know whether their potential customers are operating in a high or low risk and quick or slow feedback environment.

Moreover, the classification is hardly precise enough to allow for targeting promotion or sale efforts at the right segment in the potential adopter firms.

2.2. Overview of Organisational Climate Definitions

As Baker wrote, "the concept of climate is familiar to us all, and is implicit in everyday expressions such as 'the climate is for/against...'; 'an academic climate is more conducive to...'; 'the industrial climate...', its formal definition is, however, beset with difficulties if it is to avoid a level of generality and/or triviality which renders it useless."[81] This may be a reason for various attempts, of which some are contradictory. The following summary purports to present some "classical" statements about organisational climate, in order to draw attention to differences between opposed or divergent perspectives.

2.2.1. Synoptic Summary

The present sub-section is aimed at providing a synoptic overwiew of the various propositions and objections aroused by the concept of organisational climate (O.C.).

Fig.9- The organisational climate concept: propositions and objections

PROPOSITIONS	OBJECTIONS
* Organisational climate is equivalent to organisational culture, which includes norms, values, and the firm's history. [Blake & Mouton(82), Katz & Kahn(83)]	* The concept of culture as the basis for definition of organisational climate is too broad. [Evan(84)]
* O.C. is a normative structure of attitudinal and behavioural standards which: - provides a basis for interpreting situations; - acts as a source of pressure for directing activity. [Georgopoulos(85)]	* Excessive attention is given to objective measures of climate's attributes.[Hellriegel & Slocum(87)]
* O.C. refers to distinctive organisational characteristics influencing members' behaviour. [Forehand & Gilmer(86)]	
* O.C. relates to a set of organisational attributes which are perceived by the organisation's members. [Hellriegel & Slocum]	
* " " and which: - results from higher members' behaviour and policies; - serves as a basis for interpreting situations; - acts as a source of directing activity. [Pritchard & Karasick(88), Tagiury(89)]	* Positivistic research methodologies cannot reflect subjective perceptions. [Phenomenological Approach to Organisational Sociology]
* " " and which is amenable to measurement. [Litwin & Stringer(90)]	
* O.C. is the integrated set of the company's content, structure, process, physical environment and system of values and norms. [James & Jones(91)]	
* O.C. is a set of organisational attributes which are contingent upon the way in which the organisation members perceive their world of work. [Gavin(92)]	

One proposition cannot be logically included in Fig.9 because it

does not explicitly refer to organisational climate. This proposition is Larcon and Reitter's definition of corporate identity ("identite d'entreprise"). This conception is a compromise between corporate culture and organisational climate. It refers to the integration of political and strategic factors with symbolical and imaginary factors.[93] However, the Strategic Theory of Organised Action opposes to the view of the merging unity of the organisation's members that of a plurality of individual strategies. Here again, the contradiction seems to lie in normative versus non-prescriptive standpoints.

Reviewing most of the propositions mentioned above, El- Sherbeny was able to select three major features of the concept of organisational climate:

(i) Organisational climate refers to a set of characteristics which are peculiar to a certain organisation and distinguish it from other organisations;

(ii) Organisational climate influences the behaviour of people in the organisation in that it acts upon their attitudes, motivations and/or expectations which are direct determinants of their behaviour;

(iii) Organisational climate is amenable to subjective interpretation by members of the organisation in light of their cognitive and evaluative constructs.[94]

2.2.2. Comments

Clearly, three major trends emerge from these various definitions, which El-Sherbeny tried to reconcile. Organisational climate is viewed as either (i) a set of objective factors existing per se; or (ii) a set of objective attributes, which must be perceived and which are amenable to measurement; or (iii) a set of subjective

phenomena which do not lend themselves to positivistic assessments.

In this respect, Baker recalls Lord Kelvin (who, as far as "climate" is concerned, seems particularly relevant) saying that "measurement is essential to knowledge and understanding."[95] However, organisational climate assessment could be compared to the definition of succes or failure of new products: it is a matter of subjective interpretations. In Market Development, Baker makes the point clearly:[96]

> "... the only sure test of success or failure [is] the subjective criterion of the firm's own perception and no external, objective measure is available which can be applied across the board."

A similar assertion may be made with respect to organisational climate: as a set of objective idiosyncracies independent from the organisation's members, the concept is of poor interest. When organisational climate is viewed as a set of corporate idiosyncratic attributes existing through employees' perceptions a secondary question arises: that of assessment methods.

This theme is treated in the chapter devoted to research methodology options.

In any case, whatever the methodology may be, one property is essentially inherent in measurement or systematic (as opposed to purely intuitive) assessment: dimensionality. Any measurement supposes at least one dimension, or a continuous predicate to which degrees can be ascribed. It is not necessary for the predicate to denote a physical variable, nor for the degrees to be numerals and/or to be at equal or proportional intervals. Usually, the variable is a property or refers to a property while degrees denote the intensity of the association between the property (i.e. the predicate, or dimension) and some objects. An easy way to demarcate continuous predicates is to examine what happens when one put "very"

before the predicate. If the sentence is meaningful, i.e if it is a proposition, the predicate is continuous. All dimensions can be expressed in terms of continuous predicates. For example "size" is not a continuous predicate (viz. "very size" is meaningless), but "large" is a continuous predicate (viz. "very large" is meaningful), and "largeness" is a mode of "size": it is the property of the objects whose grades would be concentrated at the positive extreme of the dimension "size" if they were measured along that axis.

The fact that dimensionality plays a central role in measurement leads one to reviewing the dimensions of organisational climate which are usually quoted in the literature.

2.3. Dimensions of Organisational Climate

In The Nature of Decision Theory, White points out that applying any theory, be it putative or not, calls for certain measurements. But this does not presume the nature of these measurements. Rather, what White emphasises is that "measurement" is the ineluctable point where theory and practice must meet.

Then, these measurements have to be integrated in the theory from the point of view of their meaning and practical derivation.[97] Organisational climate dimensions are what enable such assessments to be made.

The following discussion aims at providing an overview of most of the dimensions referred to in the literature. By doing so, it is hoped to find clues to a suitable formulation of the problem.

2.3.1. Synoptic Summary

Five major dimensions are usually distinguished, and most of the propositions may be related to one of them, as Fig.10 indicates.

Organisational Climate Dimensions - Fig.10

Organisational structure	"Structural factors" (Forehand & Gilmer, 1964) "Structure, individual responsibility" (Litwin & Stringer, 1968) "Individual autonomy" (Campbell et al., 1970) "Intergroup clarity and conformity" (Barth, 1970) "Structural elasticity, uncertainty" (Chakrabarti, 1972) "Size, centralisation of decision-making, formalisation of procedures" (Lawler et al., 1974)
Organisational risk-taking	"Risk" (Walton, 1961; Colosky, 1967) "Security vs risk" (Campbell & Beaty, 1971) "Risk-taking" (Litwin & Stringer, 1968; Barth, 1970; Chakrabarti, 1972)
Reward	"Rewards" (Litwin & Stringer, 1968; Meyer, 1968; Campbell & Beaty, 1971; Jonannesson, 1973) "Reward orientation" (Campbell et al., 1970) "Reward emphasis"(Lawler et al., 1974)
Tolerance of conflicts	"Tolerance of conflict"(Colosky, 1967) "Conflict"(Litwin & Stringer, 1968) "Conflict vs cooperation" (Pritchard & Karasick, 1973) "Organisational process" (Lawler et al., 1974)
Warmth and support	"Leader approachability" (Friedlander, 1966) "Warmth and support" (Colosky, 1967; Litwin & Stringer, 1968; Campbell et al., 1970) "Team effort, team spirit"(Meyer, 1968; Kegan, 1971; Johannesson, 1973) "Supportiveness" (Pritchard & Karasick, 1973)

The references are quoted by El-Sherbeny, and his review of the definitions of these five dimensions may be summarised as follows:

(i) "Organisational structure" refers to rules, procedures

policies and practices to which people in the organisation feel they have to conform.

(ii) "Organisational risk-taking" refers to the degree to which employees are encouraged to take risks in their tasks.

(iii) "Reward" refers to the degree to which people in the organisation feel they are rewarded for initiating good ideas, and performing their jobs satisfactorily.

(iv) "Tolerance of conflict" refers to the willingness of management to allow different opinions and confront various views.

(v) "Warmth and support" refers to the extent to which management facilitates informal interpersonal or interdepartmental communication.

In a more analytical perspective, James and Jones have built up a list of objective elements which, in their view, constitute the components of organisational climate.[98] This list may be summarised as Fig.11 indicates.

Fig.11- Components of organisational climate (after James and Jones)

Content	Structure	Process
* Goals/objective * Ownership and control * Charter (diversity of mission) * Dependence * Resources * Age * Function * Level of technology	* Size * Centralisation of decision-making * Standardisation of procedures * Interdependence of subsystems	* Leadership * Communication * Control * Conflict resolution * Change * Coordination * Selection * Socialisation * Reward * Decision-making * Status and power relationships

Fig.11- Contd

Physical Environment	System's Values and Norms
* Physical space characteristics * Personal protection * Remoteness * Environmental hazards * Space restrictions and confinment * Endurance demands * Environmental stresses	* Conformity * Rationality * Predictability * Impersonality * Loyalty * Reciprocity * Adherence to chain of command * Local (cosmopolitan) orientation * Programmed (unprogrammed) approaches to problem solving

2.3.2. Comments

According to El-Sherbeny, in comparison with the extensive literature which is available on the impact of organisational climate dimensions upon job satisfaction and effectiveness, only a little effort has been directed to investigate the relationship between those dimensions and the organisation's receptivity to new ideas.[99] As previously pointed out, such an investigation is, nevertheless, of great operational interest to the innovator. But these various attempts to analyse organisational climate into dimensions reveal another aspect of the concept: organisational climate is too broad a concept to account for a given organisational situation. The organisational climate concept becomes helpful when it is broken into dimensions on which various organisational situations may be assesed. Then, one may raise the question of the utility of the organisational climate concept: since one has to resort to dimensions to interpret a given situation, why not simply consider the idiosyncracies themselves (structures, tolerance of conflict,...) and neglect the general concept ? The reason for using the concept of organisational climate is that it clearly

indicates that the dimensions mentioned above are not independent: each of their combinations is a singular one. The implicit postulate of the organisational climate approach is that understanding organisational situations requires, beyond the knowledge of the dimensions' idiosyncratic features, insights into how these dimensions interact in the idiosyncratic context of the organisation under consideration. As a conclusion, it can be said that some investigators see organisational climate as containing certain characteristics or phenomena which make it an objective reality:[100]

> "[Organisational climate is something] which exists outside of the organisation's members. Something which is located 'out there', which affects their behaviour and which makes the organisation distinct from others."

Another school of organisational climate researchers accepts the objective existence of climatic factors such as groups, individuals, external environment, but also holds that the climate depends on the way in which the organisational members perceive their world of work.[101]

With regard to the various field sites and methods of data collection that were used in organisational climate studies, a reasonably complete summary is provided by El-Sherbeny, so the present research can concentrate on methodological questions.[102] All these research methods resorted to questionnaires, sometimes together with interviews or group meeting observations. Rather than quoting the series of the attempts made to assess organisational climate's dimensions, it seems more instructive to study two researches, typifying and representing the methodology to which they resorted. The following sub-section is devoted to this purpose.

2.4. Threats to Organisational Climate Assessment

Two selected examples in the contemporary literature will shed some light on the major threats to organisational climate assessment.

2.4.1. Violated Rationalities

El-Sherbeny's research provides a good example for argument. His research concentrated on assessing behavioural and organisational influences upon the adoption of industrial product innovations. The Crawford-Pickering multi-colour machine (used in the manufacture of tufted carpets) was selected as the practical basis for his empirical findings. The sample consisted of 26 companies operating in the tufted carpet industry. El-Sherbeny focused the analysis on assessing association between five sets of firm-related variables and adoption responses. These variables were:

(i) Organisational climate (favourable/unfavorable to risk taking, rewards for innovative ideas and facilitating interpersonal communication);
(ii) Top management attitudes (supportiveness to innovation);
(iii) Orientation of the firm towards marketing;
(iv) System of internal organisation for generating innovations;
(v) Information acquisition policies and strategies.

Five questionnaires were addressed to each managing director together with a covering letter asking him, and those of his colleagues who were involved in the decision about the innovation, to complete the questionnaires (in the absence of precise information the managing director appeared to be the most appropriate to approach in such situation). The statistical methods which were used to analyse the data were:

(i) The analysis of means completed with "t-test" (to assess how different were the adopters and non-adopters in respect of the values of the independent variables);

(ii) The computation of correlation coefficients between the dependent variable (adoption or rejection) and each of the independent variables (resulting from the five dimensions mentioned above).

The findings generally corroborated the classical associations between perceived advantage of the innovation and adoption. More interesting are the findings related to association between risk-taking attitude and adoption. According to El-Sherbeny, the risk-taking variable has succeeced in distinguishing between adopter and non-adopter firms: "The risk-taking behaviour of adopters was found to be consistently different from that of non-adopters."[103] He concluded that:

(i) "Adopters perceived the innovation as less risky than did non-adopters"(p.343);
(ii) "The perceived confidence is greater among adopters than among non-adopters, in regard to the (technico-economic) conditions related to the machine".(p.346)

Then, to what extent can it be held that the adopters were risk-takers? When asked (p.343): " How much were you personally taking risk in the decision ?" the adopters' scores were about half that of the non-adopters. No doubt, the managers of the adopter firm would be surprised to be called "risk-takers". However, the managerial literature states a contrary opinion and very often one comes across expressions such as: "... it is a truism that innovation is highly risky";[104] or "... innovation is essentially a risky process".[105] In other words, those the literature labels as "risk-takers" think they do anything but take risks. How can the paradox be resolved? The solution seems to be the following: managers and researchers are not talking about the same thing. As a

phenomenologist would say, risk does not show itself in the same light in adopters and marketing researchers' consciousness:

(i) The manager seems to answer a question asking: "Was your decision encompassing threats to your status or to the firm's welfare?"

(ii) While the researcher means something like: "Does the adopter have accurate knowledge of the probability distribution of the consequences of each alternative (adoption / rejection)?"[106]

This points out the major threat to understanding organisational situations. The researcher's quest for "objectivity" may instil an alien rationality in the process of collecting information from the innovators. In other words, the investigator may "violate" the respondent's rationality. By "rationality", March means a procedure for deciding what is correct behaviour by relating consequences systematically to objectives.[107] Thus, the concept of rationality, at the individual level, is factorable to the following dimensions:

(i) An adjusting procedure,

(ii) Reference objectives,

(iii) Adjusted possible consequences.

Therefore, it follows that the three main ways in which the innovator's rationality can be violated are, on the part of the researcher:

(i) Procedure violation, or the implicit/explicit reference to an adjusting procedure which differs from the respondent's;

(ii) Objective violation, or the presumption of objectives which differ from the respondent's actual reference objectives;

(iii) Consequence violation, or the presupposition of adjusted consequences which differ from the respondent's own perception of the possible consequences of his behaviour.

2.4.2. Tautologies

An impressive pacemaking contribution to the lore of innovation in organisations was made in 1967, when Charles Carter and Bruce Williams published their study on the Factors Governing the Speed of Application of Science".[108] In fact, their study was not explicitly dealing with organisational climate, but its central concern was very akin, if not identical, to that of studying organisational climate's dimensions. The methodology followed by Carter and Williams was to categorise (a priori) firms as either progressive or non-progressive and then discriminate those common factors which distinguish one set from the other. As they noted:[109]

> "... the significant outcome is that there are twenty-four characteristics which are not only (by definition) present in progressive firms, but also prove to be generally absent in unprogressive firms. These we may fairly call 'characteristics related to progressiveness'."

The method is interesting from an epistemological viewpoint. Carter and Williams's approach deals with the general problem of concepts, or universals, and could be related to Heidegger's famous dilemma: the philosopher's purpose is to gain insights into and study Art; but as, by definition, he does not know what Art is as a concept, he must resort to the empirical study of works of art. But then the philosopher faces an other indeterminant: how can he distinguish works of art from anything else since, by definition again, he does not know what is Art?[110]

Similarly, one is entitled to question the methodological

foundation of Carter and Williams's approach, and to wonder whether, and to what extent, the 24 characteristics were not, among others, and perhaps less accurately conceptualised, already present in the researchers' mind, since they were able to categorise the "group of highly progressive firms" a priori.

From the aforesaid, it follows that the main contribution of this research was one of explicitation. Then, using a simple weighting scale (from zero to eight for each characteristic) Carter and Williams were able to test the 24 characteristics by discriminating well between highly progressive and non-progressive firms. Again, it is to be considered that this test does prove but one thing: the synthetic and subjective perception of a firm's progressiveness (in Carter and Williams's sense) is amenable to an analytic corroboration grounded on objective criteria.

Finally, as regards the validity of the characteristics, what is the theoretical interest in proving it? The point, here, is not to advocate vagueness in methodology but, conversely, to understand the real meaning of any formalised test already used within the field under consideration. Again the question remains: were not the researchers well able, before identifying the characteristics, to distinguisn the progressive firms?

To be sure, herein lies the gist of the matter, as regards the objective vs subjective dichotomy. Consider the features of Carter and Williams's logic. On the basis of the degree of association between various units (firms) and a particular attribute (technical progressiveness), two sets are designed. One set contains the units highly correlated with the attribute, the other consists of the remaining units (non-progressive firms). Then, a grid of selective-exclusive criteria is set up: it includes all the properties (the 24 characteristics) common to the units of the first set (highly progressive firms). Finally the test of validity

consists in assessing the extent to which, by applying this grid of criteria to the union of the two sets, the two original sets can be isolated back. Not surprisingly, the two sets could be well retrieved.

To what extent is such a methodology not akin to what one would label a tautology? But it was a seminal tautology, the organisational literature proves this. Because, social sciences are a cumulative body of knowledge, Carter and Williams's characteristics proved useful to various investigators. For instance, Baker was able to use some of the 24 characteristics as a basis for measuring receptivity to innovation together with dimensions of organisational structure and climate. This study is reported at length by Baker.[111]

Moreover, if one is to go deeper, one may wonder whether, in social sciences, one is not bound to use tautologies, or to be arbitrary (at least once in his/her reasoning). Analytic judgments are bound to be tautologies since the union of the predicate and the subject is thought of in terms of identity (an example of analytic judgment could be: "Progressiveness is the attribute in vertue of possessing which a firm qualifies for membership of the class of the progressive firms"). On the other hand, synthetic judgments (based on experimentation or empirical research) cannot start without, at least, an arbitrary statement (such as: "Obviously, Sony is a progressive firm"). It could be argued that this statement is not an arbitrary one ("It's obvious!"). But then, if the characteristics of progressiveness are obvious, why do we have to resort to a complicated methodology to identify them?[112]

2.5. Recapitulation of the Second Section

From a methodological viewpoint, two arguments have been set

forward:

(i) The research methodologies often resorted to may violate the various rationalities addressed by the data collection;

(ii) Researches' outcomes may, in effect, be tautologous. Beyond the difficulty of avoiding tautologies in social sciences, it is to be added that some tautologies prove useful, because they result in healthy - if not heuristic - explicitation.

Further, a unified definition of organisational climate is far from being achieved. The following section concentrates on answering the question of how this lack of consensus affects the approach.

SECTION 3 EPISTEMOLOGY: STATUS OF THE ORGANISATIONAL CLIMATE APPROACH

The question raised in the introduction to this chapter concerning the epistemological status of the organisational climate approach is now amenable to a more accurate examination. A definition may first prove useful. The following sub-section is aimed at providing such a clarification.

3.1. Definitions of the Organisational Climate Approach

This expression, as any concept, may be defined either in extension or in intension:

(i) In extension, the organisational climate approach may be defined as a method of interpretation of organisational behaviour by resorting to the dimensions previously reviewed (see 2.3.1.).

(ii) In intension, this approach may be defined as a specific

interpretation of organisational micro- relationships by combining environmental macro- relationships with organisational and individual conditions and constructs.

"Organisational micro-relationships" refer to leadership, the way people behave with others in the organisation, etc. Environmental macro-relationships refer to the links between the organisation and its environment, to all the organisational idiosyncracies which make sense only when related to the environment. For example, "objective" attributes such as size or technology are not significant in themselves. The size is "large" if most of the other organisations' size is smaller, and technology is "complex" if most of the others in the environment are less so.

"Organisational constructs" refer to the prevailing idiosyncratic norms and values, etc. Individual constructs refer to the particular framework through which each member assesses his participation in the organisation. It is proposed to include individual strategies and rationalities in this set. As far as the concept itself is concerned, a provisory definition can be proposed: "organisational climate" denotes a set of idiosyncratic corporate constructs and conditions affecting organisational processes. By mentioning "conditions" it is meant to distinguish "organisational climate" from "organisational culture" (which has, in theory, nothing to do with "level of organisational stress" , for example). A more accurate definition of the concept will be given in the light of the empirical findings.

3.2. Organisational Climate and Theory

Organisational Climate has generated definitions, dimensions to be assessed on, and given rise to various tests as to its effects (cf.,

for instance El-Sherbeny's research, previously referred to). To what extent can one conclude that there exists a theory of organisational climate ?

Obviously, the answer is a matter of definition. For example, the organisational climate approach may be viewed as a theory according to Parson's definition of theories in social sciences, which states that " a theoretical system is a body of logically interdependent generalised concepts of empirical reference". [113] However, this definition has been criticised by Homans on the ground that "concepts and their definitions are certainly part of a theory, but they are not sufficient by themselves to constitute a theory... A theory is a deductive system, and no deduction can be made from concepts alone: propositions are absolutely necessary." [114] According to Homans, a theory, in social sciences, consists of three major sets:[115]

(i) A set of concepts, or conceptual scheme. Some of the terms in the scheme may be referred to as descriptive concepts, serving to show what the theory is about. Others are termed operative concepts, or properties of nature.

(ii) A set of propositions ("non-contingent propositions"), each stating a relationship, such as "varies directly with", between at least two of the properties. The propositions form a deductive system, which provides ground for prediction.

(iii) A set of contingent properties, in the sense that experience is relevant to their truth or falsity or to that of propositions derived from them.

Although Homans acknowledges that "there are few theories in sociology... that meet the derinition... of what a theory ought to be,"[116] his framework provides useful indications to solve the problem under consideration. First, the organisational climate

approach has generated a conceptual scheme. But both its descriptive and operative concepts are borrowed from already existing sociological, psychological, anthropological, etc. theories (e.g., the concepts of behaviour, attitude, values, norms, etc.). Second, organisational climate studies resort to non-contingent propositions (e.g., "is correlated with", "is significantly different from", etc.). Third, the organisational climate approach has given rise to some contingent propositions: for example, El-Sherbeny's hypothesis that adoption is highly correlated with risk-taking orientation.

3.3. Organisational Climate and Models

At this stage a step forward may result from a combination of Braithwaite's theory and model definitions with the results of the previous analysis. Braithwaite defines a theory, T, as " a deductive system consisting of initial hypotheses at the summit and empirically testable generalisations at the base", and a model, M, of a theory, T, as "a mapping of the theory T, so that some concepts and relations in T hold in a mapped form in M."[117] In other words, a model is a set of hypotheses, linked in some manner, whereas a theory is concerned with what can be deduced from the hypotheses.

The organisational climate approach borrows its descriptive and operative concepts from existing theories; those concepts, through non-contingent propositions, are generally linked in new contingent propositions. Accordingly, the organisational climate approach is not a theory: it consists of various models of various sociological and organisational theories. Some of these theories are more amenable to giving rise to such models. Those theories' common feature is that of assuming the irreducibility of idiosyncratic organisational behaviour to a techno-economic determinism, be it

environmental, structural, or multivariate. The first section of the present chapter was concerned with dicussing this idea (cf., the last two reviewed theories).

3.4. Organisational Climate and Paradigms

From the aforesaid, an analogy could be drawn from what Kuhn wrote about paradigms in natural sciences. According to this author, a paradigm is what the members of a scientific community share.[118] Indisputably, the variety of approaches to organisational climate definition (see fig.9) does not suggest such a consensus. But Kuhn made it clear:[119]

> "Lack of standard interpretation or of an agreed reduction to rules does not prevent a paradigm from guiding research.. The existence of a paradigm need not even imply that any full set of rules exists."

In other words, the determination of a shared paradigm is not, however, the determination of shared rules.[120] In Kuhn's view, a paradigm is:[121]

> "... an object for further articulation and specification under new or more stringent conditions.. Paradigms gain from their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognise as acute."

In this respect, the review carried out in the present chapter strongly indicates that the pure techno-economic approach was not entirely conclusive in its attempt to account for organisational behaviour, so much so that different approaches have been resorted to, including the organisational climate approach. Then, if we consider Kuhn's twofold condition for paradigm's existence: (i) achievement is sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity; and (ii) simultaneously, it is sufficiently open-ended to leave all

sort of problems for the redefined group of practioners to resolve, it follows that organisational climate may be held as a paradigm of social sciences.[122] This conclusion builds on the following premises:

(i) "Organisational climate" stands as a shared reference in social sciences, although there is no consensus either on its definition or effects.

(ii) The organisational climate concept has been adopted by a set of practitioners, as an efficient tool in terms of descriptive or predictive approaches to organisational behaviour.

This distinction between model, theory and paradigm is not a spurious one. If only because it may be useful to know what is being considered.

4. Conclusion of the Third Chapter

This chapter has reviewed the main organisation theories as they may take into consideration non-strictly techno-economic organisational idiosyncracies (Section 1). Then, it was possible to review the main propositions and objections aroused by the paradigm of organisational climate, the difficulties raised by the measurement of its dimensions, and the main threats to such an evaluation (Section 2). Finally, these analyses allowed for determining the epistemological status of the organisational climate approach (Section 3). Accordingly, it may now be suggested what could be done in order to contribute to magnifying the operational aspect of the organisational climate paradigm, with regard to the marketing of industrial innovations.

It is proposed to characterise the firm through its diverse members' rationalities as these attach to particular strategies. In other words, it is proposed to consider organisational actors' rationalities and strategies as elements of the set of factors which determine the organisation's climate. This perspective will be clarified and refined in the remainder of the thesis.

Then, the point at issue is to connect these two dimensions, namely individual strategies and rationalities, to organisational climate.

How does the idea of such a connection articulate itself with the current theories on innovation acceptance and collective decision-making? The fourth and fifth chapters focus attention on these two problems.

CHAPTER III

NOTES AND REFERENCES

1- Popper, K.R. The logic of scientific discovery (fifth edition, first published 1935). London, Hutchinson & Co., 1968, p.108.

2- Parker, S.E. Op.cit., p.105.

3- Nabseth, L., & G.F. Ray. Op.cit., p.166.

4- Popper, K.R. Op.cit., p.108.

5- Ibid., p.60.

6- Larcon, J.-P., & R. Reitter. Op.cit., p.26.

7- Scott, W.G. Organisation theory: an overview and an appraisal. Academy of Management Journal, vol.4, April 1961, pp.7-26.

8- Weber, M. The theory of social and economic organisation. Translated from German by A.M. Henderson & T. Parsons. New York, The Free Press, 1947.

9- Ibid., p.337.

10- Ibid., pp.330-340.

11- Thompson, V.A. Bureaucracy and innovation. University, Alabama, University of Alabama Press, 1969, pp.15 and 16.

12- Burns, T. & G.M. Stalker. Op.cit.

13- Lynton, R.P. Linking an innovative subsystem into the system. Administrative Science Quarterly, vol.14 (3), 1969, pp.398-416.

14- Zaltman, G., et al. Op.cit., p.125.

15- Ibid.

16- The necessarily limited dimension of this review prohibits expatiating on the various contributions to each schools. However, a small number of works may be held for representative of each doctrine. For the Human Relation Movement these are:

- Mayo, E. The social problems and industrial civilisation. Cambridge, Mass., Harvard University Press, 1939.

- Homans, G.C. The human group. New York, Harcourt, Brace, 1950.

- Maslow, A.H. Motivation and personality. New York, Harper, 1954.

- McGregor, D. The human side of enterprise. New York, McGraw-Hill, 1960.

- Likert, R. New patterns of management. New York, McGraw-Hill, 1960.

- Vroom, V.H. Work and motivation. New York, Wiley, 1964.

- Argyris, C. Integrating the individual and the organisation. New York, Wiley, 1964.

- Schein, E.H. Organisational psychology. Englewood Cliffs, N.J., Prentice Hall, 1965.

- Bennis, W.G. Changing organisation. New York, McGraw-Hill, 1966.

- Herzberg, F. Work and the nature of men. Cleveland, World Publishing Company, 1966.

17- Coch, L., & J.R.P. French. Overcoming resistance to change. In Human factors in management, edited by S.D. Hoslett. New York, Harper & Row Publishers, Inc., 1951, pp.242-268.

18- See: Roethlisberger, F.G., & W.J. Dickson. Management and the worker. Cambridge, Mass., Harvard University Press, 1939.

19- Scott, W.G. Op.cit.

20- Larcon, J.-P., & R. Reitter. Op.cit., p.26.

21- See, for instances:

- Walker, C.J., & R.H. Guest. The man on assembly line. Cambridge, Mass., Harvard University Press, 1952.

- Zalesnik, A., & D. Moment. The dynamics of interpersonal behaviour. New York, Wiley, 1964.

- Whyte, W.F. An intercultural context for organisational research. In Organisational behaviour, theory and application, edited by W.F. Whyte. Homewood, Ill., Irwin, Dorsey Press, 1969, pp.719-742.

22- See, for instances;

- Cadwalder, M. The cybernetic analysis of change in complex organisations. American Journal of Sociology, vol.65, 1959, pp.154-157.

- Deutsch, K.W. The nerves of government: models of political communication and control. New York, The Free Press, 1961.

- Katz, D., & R. Kahn. The social psychology of organisation. New York, Wiley, 1966.

- Metayer, G. Cybernetique et organisation. Proceedings of the 6th International Congress on Cybernetics. Namur, Belgium, September 1970, pp.773-787.

- Hoogendoorn, D. The system of human organisation and the cybernetic view of management. Proceedings of the 6th International Congress on Cybernetics. Namur, Belgium, September 1970, pp.994-1010.

23- Zaltman, G., et al. Op.cit., p.127.

24- Crozier, M., & E. Friedberg. Op.cit., pp.24 and 25.

25- Ibid., p.211.

26- Ibid.,p. 40.

27- See, for example: Argyris, C. Integrating the individual and the organisation. Op.cit.

28- See in particular:

- Burns, T., & G.M. Stalker. The management of innovation. Op.cit.

- Hall, R.H., J.E. Hass, & J.N. Jonnson. Organisational size, complexity and formalisation. American Sociological Review, vol.32, 1967, pp.903-912.

- Miller, E.J., & A.K. Rice. Systems of organisation: the control of task and sentient boundaries. London, Tavistock, 1967.

- Lawrence, P.R., & J.W. Lorsch. Developing organisations: diagnosis and action. Reading, Mass., Addison-Wesley, 1969.

- Pugh, D.S., et al. The context of organisational structures. Administrative Science Quarterly Review, vol.14, 1969, pp.91-114.

- Perrow, C. Organisational analysis: a sociological view. London, Tavistock, 1970.

- Woodward, J. (Editor) Industrial organisation:behaviour and control. London, Oxford University Press, 1970.

- Blau, P.M., & R.A. Schoenherr. The structure of organisation. New York, Random House, 1970.

- Hickson, D.J., et al. A strategic contingency theory of intra-organisational power. Administrative Science Quarterly, vol.16 (2), pp. 216-229.

- Hickson, D.J., et al. The culture-free context of organisation culture: a tri-national comparison. Sociology, vol.8, 1974, pp.59-81.

29- See:

- Woodward, J. Management and technology. London, HMSO, 1958.

- Woodward, J. Industrial organisation: theory and practice. London, Oxford University Press, 1965.

30- Harvey, E. Technology and the structure of organisation. American Sociological Review, vol.33, 1968, pp.247-259.

31- Crozier, M., & E. Friedberg. Op.cit., p. 116.

32- Hickson, D.J., & al. Operation technology and organisation structure: an empirical reappraisal. Administrative Science Quarterly, vol.14, 1969, pp.378-397.

33- Perrow, C. A framework for the comparative analysis of organisations. American Sociological Review, vol.32, 1967, pp.194-208.

34- Perrow, C. Organisational analysis.. Op.cit., p.80.

35- Argyris, C. The applicability of organisational sociology. Camgridge, Mass., Harvard University Press, 1972, p.37.

36- See: Blau, P.M. The formal theory of differentiation in organisation. American Sociological Review, vol.35, 1970, pp.201-218.

37- For further details on these dimensions and their determination see:

- Pugh, D.S., et al. Dimensions of organisation structure. Administrative Science Quarterly, vol.13, 1968, pp.65-105.

The results of this multivariate analysis are available in:

- Pugh, D.S., et al. The context of organisational structures. Administrative Science Quarterly, vol.14, 1969, pp.91-114.

38- See, for similar conclusions:

- Hinings, C.R., et al. An approach to the study of bureaucracy. Sociology, vol.1, 1967.

Or:

- Hall, R.H. The concept of bureaucracy; an empirical assessment. American Journal of Sociology, vol.69, 1963, pp.32-40.

39- Crozier, M., & E. Friedberg. Op.cit., p.124.

40- Burns, T., & G.M. Stalker. Op.cit.

41- Emery, F.E., & E.L. Trist. The causal texture of organisational environment. Human Relations, Vol.18, 1965, pp.21-32.

42- Lawrence, P.R., & J.W. Lorsch. Organisation and environment: managing differentiation and integration. Harvard Business School, 1967.

43- Child, J. Organisational structure, environment and performance: the role of strategic choice. Sociology, vol.6, 1972, pp.1-22. (particularly pp.3-5)

44- Cyert, R.M., & J.G. March. A behavioural theory of the firm. New York, Prentice Hall, 1963.

45- Chandler, A.D., Jr. Strategy and structure. Cambridge, Mass., MIT Press, 1962.

46- See, for example:

- Stopford, J.M. Growth and organisational change in the multinational firm. D.B.A. dissertation, Harvard Business School, 1968.

- Wrigley, L. Divisional autonomy and diversification. D.B.A. dissertation, Harvard Business School, 1970.

- Dyas, G.P., & H.T. Thanheiser. The emerging european enterprise,

strategy and structure in French and German industry. London, Macmillan, 1976.

47- Grinyer, P.H., M. Yasai-Ardekany, & S. Shawki Al-Bazzaz. Strategy, structure, the environment, and financial performance in 48 United Kingdom companies. Academy of Management Journal, vol.23, 1980, pp.193-226.

48- For an overview of A. Comte's "Law of the Three States" in English, see:

- Comte, A. The progress of civilisation through three states. In Social change - Sources, patterns and consequences, edited by A. & M. Etzioni (second edition) New york, Basic Books, 1964, pp.15-26.

49- March, J.G., & H.A. Simon. Organisations. New York, Wiley, 1958.

50- Allison, G.T. The essence of decision - Explaining the Cuba missile crisis. Boston, Little, Brown, & Co., 1971.

51- For instance: Lindblom, C.E. The intelligence of democracy. New York, Wiley, 1958.

52- Crozier, M., & E. Friedberg. Op.cit., p39.

As indicated by Simon, the origin of the concept of limited rationality can be traced back to Cournot's theory of rational choice in imperfect markets involving two firms, in which it is referred to "limited cleaverness". In fact, Cournot's term ("intelligence limitee") means more than "cleverness". It also means "understanding" and, to some extent, "information". See:

- Simon, H.A. The sciences of the artificial (second edition, first published 1969). Cambridge, Mass., MIT University Press, 1981, p.45.

- Cournot, A. Recherches sur les principes mathematiques de la theorie des richesses. Paris, Louis Hachette, 1838.

Simon's reference is in the English translation: Researches into the mathematical principles of the theory of wealth. New York, Augustus M. Kelley, 1960.

53- Schűtz, A. Der sinnhafe Aufbau der sozialen Welt: ein Einleitung in die verstehende Soziologie. Vienna, Julius Springer, 1932.

54- Weber, M. Witschaft und Gesellschaft. Tubingen, 1922. (English translation by A.M. Henderson & T. Parsons: The theory of social and economic organisation. Glencoe, Ill., The Free Press, 1957.)

55- Husserl, E. Formale und transzendentale Logik. Haile, Niemeyer, 1929.

56- See, for instances:

- Berger, P.L., & T. Luckman. The social construction of reality: a treatise in the sociology of knowledge. New York, Doubleday, 1966.

- Goffman, E. The presentation of self in everyday life. New York, Doubleday, 1959.

57- Huczinski, A.A., & I.B. Mmobuosi. Introduction to phenomenology and its application to social science research. Working paper, University of Glasgow, Department of Management Studies, 1983, p.14.

58- Smircich, L. Concepts of culture and organisational analysis. Administrative Science Quarterly, Vol.28, 1983, pp.339-358.

59- See: Pondy, L.R., & I.I. Mitroff. Beyond open system models of organisation. In Research in organisational behaviour, edited by L.L. Cumings & B.M. Staw. Greenwich, C.T., JAI Press, vol.1, 1979, pp.3-39.

60- Turner, B.A. Exploring the industrual subculture. London, Macmillan,1971.

61- Pettigrew, A.M. On studying organisational cultures. Administrative Science Quarterly, vol.24, 1979, pp.570-581.

62- Whorton, J.W., & J.A. Worthley. A perspective on the challenge of public management: environmental paradox and organisational culture. Academy of Management Review, vol.6, 1981, pp.357-363.

63- Peters, T.J. Symbols, patterns and settings: an optimistic case for getting things done. Organisational Dynamics, vol.7, 1978, pp.3-29.

64- Pfeffer, J. Management as symbolic action: the creation and maintenance of organisational paradigms. In Research in organisational behaviour, edited by L.L. Cummings & B.M. Staw. Greenwich, C.T., JAI Press, 1981, vol.3, pp.1-52.

65- Dandridge, T.C. Celebrations of corporate anniversaries: an example of modern organisational symbols. Working paper, State University of New York at Albany, 1979.

66- Wilkins, A., & J. Martin. Organisational legends. Working paper, Graduate School of Business, Stanford University, 1980.

67- Martin, J., & M.E. Powers. Truth or corporate propaganda: the value of a good war story. In Organisational symbolism, edited by L.R. Pondy, P. Frost, G. Morgan, & T. Dandridge. Greenwich, C.T., JAI Press (forthcoming).

68- Trice, H.M., & J.M. Beyer. The ceremonial effect: manifest function or latent dysfunction in the dynamic organisation. Paper presented at the Conference on Myths, Symbols, and Folklore: Expanding the Analysis of Organisations. Los Angeles, University of California, March 1983.

69- Handy, C.B. Understanding organisations (second edition). Harmondsworth, Penguin Books, 1982, p.177.

70- See: Deal, T.E., & A.A. Kennedy. Corporate cultures - The rites and rituals of corporate life. Reading, Mass., Addison-Wesley Publishing Company, 1982, p.107.

71- Ibid.

72- These companies were: Caterpillar Tractor, General Electric, Du Pont, Chubb Insurrance, Price Waterhouse & Co., 3M, Jeffersson-Smurfit, the Training Services Administration Agency of the British Government, Digital Equipment Corporation, International Business Machines, Dana Corporation, Procter & Gamble, Hewlet-Packard, Leo Burnett Advertising Agency, Johnson & Johnson, Tandem Computer, Continental B.K., and the Rouse Corporation.

73- Deal, T.E., & A.A. Kennedy. Op.cit., p.107.

74- Ibid., pp.13-16.

75- Ibid., p.107.

76- Ibid., pp.15-16.

77- Smircich, L. Op.cit., p.344.

78- See: Pfeffer, J. Op.cit.

79- Peters, T.J., & R.H. Waterman. In search of excellence. New York, Harper and Row, 1982.

80- Smircich, L. Op.cit., p.344.

81- Baker, M.J. Marketing new industrial products. Op.cit., p.85.

82- Blake, R.R., & J.S. Mouton. The managerial grid. Houston, Gulf Publishing Company, 1964.

83- Katz, D., & R. Kahn. Op.cit.

84- Evan, W.M. Indices of the hierarchical structure of industrial organisation. Management Science, vol.9, 1963, pp.468-477.

85- Georgopoulos, B.S. Op.cit.

86- Forehand, G.A., & B. Gilmer. Environmental variations in studies of organisational behaviour. Psychological Bulletin, vol.62 (6), December 1964.

87- Hellriegel, D., & J.W. Slocum. Organisational climate: measures, research, and contingencies. Academy of Management Journal, vol.17 (2), 1974.

88- Pritchard, R., & B. K. Karasick. The effects of organisational climate on managerial job performance and job satisfaction. Organisational Behaviour and Human Performance, vol.10, 1973.

89- Tagiuri, R. The concept of organisational climate. In Organisational climate: exploration of a concept. Boston, Harvard University Press, 1968.

90- Litwin, G.H., & R.A. Stringer. Motivation and organisational climate. Division of Research, Graduate School of Business Administration, Harvard University, Boston, 1968, p.1.

91- James, R., & A.F. Jones. Organisational climate, a review of theory and practice. Psychological Bulletin, vol.81, 1974, pp.1074-1112.

92- Gavin, J.F. Organisational climate as a function of personal and organisational variables. Journal of Applied Psychology, vol.60 (1), pp.135-139.

93- Larcon, J.-P., & R. Reitter. Op.cit., pp.43-66.

94- El-Sherbeny, A.F. Op.cit., pp.96-110.

95- Baker, M.J. Industrial buying behaviour and the adoption of innovation. Op.cit., p. 351.

96- Baker, M.J. Market development: a comprehensive survey. Harmondsworth, Penguin Books, 1983, p.49.

97- White, D.J. The nature of decision theory. In Theories of decision in practice, edited by D.J. Whyte & K.C. Bowen. London, Hodder & Sloughton, 1975.

98- James, R., & A.F. Jones. Op.cit.

99- El-Sherbeny, A.F. Op.cit., p.111.

100- Huczinski, A.A., & I.B. Mmobuosi. Op.cit., p.60.

101- Ibid.

102- El-Sherbeny, A.F. Op.cit., pp.106-108.

103- Ibid., p.348.

104- Littler, D.A. How to lessen the risk factor in innovation. Industrial Advertising and Marketing, vol.11 (1), 1974, p.33.

105- Rothwell, R. From invention to new business via the new venture approach. Management Decision, vol.13 (1), 1975, p.15.

106- See: March, J., & H. Simon. Organisations. Op.cit., p.137.

107- March, J.G. The technology of foolishness. In Ambiguity and choice in organisations, edited by J.G. March & J.P. Olsen. Bergsen-Oslo, Universitetsforlaget, 1976, pp. 69-81.

108- Carter, C.F., & B.R. Williams. Industry and technical progress - Factors governing the speed of application of science. Oxford University Press, 1957, pp.177-188.

109- Ibid., p.178.

110- See: Heidegger, M. Poetry, language, thought - The origin of work of art . Translated from German by A. Hofstadter. New York, Harper and Row, 1971.

Armstrong describes a similar problem when he reminds us of Socrates' (and G.E. Moore's) "Paradox of Analysis":

"If we ask what sort of thing an X is ... then either we know what an X is, or we do not. If we know, then there is no need to ask the question. If we do not know, then there is no way to begin the investigation. The enquiry is either pointless or impossible. The orthodox, and I think correct, solution of this puzzle is that we do not start with blank ignorance of what an X is. Instead, we

start with an unreflective, unselfconscious or merely practical grasp of the thing. The philosophical object is to pass from this to an articulate explicit and reasoned grasp of what an X is... In such investigations it is a great advantage, to say the least, if we can securely identify instances of X. Given such paradigms, we can to some extent tie the enquiry down ... If we can be sure that A is an X, then we can use other things which we know or believe about A to check the proposed account of X." (Armstrong, D.M. What is a law of nature? Cambridge, Cambridge University Press, 1985, pp.5 and 6.)

This method is that followed by Carter and Williams, the paradigms being the firms which "can securely be identified " as progressive. On top of this, it may be argued in detense of Carter and Williams, that "not all circular explanations are vicious; some can be highly informative, even to the extent of yielding genuine semantic insight into the terms in question". Similarly, it may be suggested that "given an intuitive grasp of the notion in ordinary usage ... consideration of border lines gives rise to interest in a sharper characterisation of the notion [here, "progressiveness"] in a context where rules can be provided explicitly to reduce vague areas of application". (Grayling, A.C. An introduction to philosophical logic. Brighton, Harvester Press Ltd, 1982, pp. 56 and 57.).

111- Baker, M.J. Marketing new industrial products. Op.cit.

112- This discussion on analytic and synthetic judgments is based on Kant's distinction in his Critique of Pure Reason. Kant terms "analytic judgments " those in which "the connection of the predicate with the subject is cogitated through identity": those in which "this connection is cogitated without identity are called synthetic judgments". The former may be called "explicative", the latter "augmentative" judgments. That is, analytic judgments add in the predicate nothing to the conception of the subject, but only analyse it into its various elements already in the subject's mind (although in a vague way); on the contrary, synthetic judgments really add to, and do not merely analyse or explain the conceptions which make up the sum of the subject's knowledge. See: Kant,I. Critique of pure reason. Translated from German by J.M.D. Meiklejohn. London, G. Bell & Sons, Ltd., 1924, p.7.

113- Parson, T. Essays in sociological theory, pure and applied. Glencoe, Ill., The Free Press, 1949, p.17.

114- Homans, G.C. Contemporary theory in sociology. In Handbook of modern sociology, edited by R.E.L. Faris. Chicago, Rand McNally & Co., 1964, pp.951-977, p.957.

115- Ibid., p.951 and 952.

116- Ibid., p.956.

117- Braithwaite, R. Models in the empirical sciences. In Logic methodology and philosophy of science, edited by E. Nagel, P. Suppes, & A. Tarski. Stanford University Press, 1962, pp.224-231.

118- Kuhn, T.S. The structure of scientific revolutions (second edition, enlarged). Chicago, University of Chicago Press, 1970, p. 176.

119- Ibid., p.44.

120- Ibid., p.43.

121- Ibid., p.23.

122- Ibid., p.10.

CHAPTER IV

SECOND HEMISPHERE: THE NORMATIVE THEORY OF INNOVATION

0. Introduction

Chapter III was concerned with defining the first component of the problem which is at the centre of the present research. As already explained, the point is to work out an efficient operationalisation of the interface between organisational climate (viewed as a synthesis of non-strictly techno-economic corporate idiosyncracies) and the acceptance of industrial innovations.

In this respect, the epistemological status and a tentative definition of the organisational climate approach have been discussed, before suggesting other organisational idiosyncracies which may be viewed as elements of the company's climate: the organisational actors' rationalities and strategies.

Consequently, the focus must now be placed on the second component of the problem. Accordingly, the present chapter concentrates on what Baker denotes as the "normative theory of innovation".[1]

Two symmetrical aspects are fundamental to the study of the innovation phenomenon, particularly when dealing with industrial products: (i) the process which concerns the addressing system, and (ii) the process which concerns the addressed system.

By resorting to the concepts of addressing or addressed systems, it is meant, first, to enhance the symmetry of the process, and, second , to sidestep the problem of specifying whether it is referred to manufacturers, sellers, hirers, etc. ("addressing

systems") on the one hand, or adopters, non-adopters, etc. ("addressed systems") on the other hand.

Briefly, the concept of addressing system refers to the organisation which proposes the innovation system, while the concept of addressed system(s) refers to the organisation(s) to which the innovation system is proposed.

Consequently, the present chapter is divided into two sections: Section 1 deals with the theory relating to addressing systems, while Section 2 concentrates on the theory of addressed systems. In both cases, it is aimed at determining the implicit postulates which underlie the various approaches, and suggesting alternative (hopefully useful) considerations.

SECTION 1 THE INNOVATION PROCESS WITHIN THE ADDRESSING SYSTEM

The innovation process within any addressing system may be approached in terms of new product development. In Market Development, Baker contrasts the guiding role of theory in applied sciences such as medicine or engineering with the marketing practitioners' propensity to dismiss theoretical considerations as "unhelpful" and concludes that marketing - as a profession - has a lot to gain from normative theories (of product or market development).[2]

The series of sequences which comprise the process of development of a new product are generally represented by a model containing six phases as suggested by Booz-Allen & Hamilton, Inc.:

Exploration ----> Screening ----> Business Analysis ----> Development ----> Testing ----> Commercialisation

Since, according to Baker, all these phases are "recommended and are usually found to be present in case histories of new product

development," this model will provide guidelines for the present section.[3]

1.1. Exploration within the Addressing System

By exploration, it is meant the generation of ideas intended to result in innovations. The psychological process of idea generation has received considerable attention and, while it is acknowledged that creativity plays a crucial part in this process, opinions diverge about definitions, related models and methods.

1.1.1. The Problem of Creativity

The complex relationship between creativity and innovation is underlined by Morton's contention:[4]

> "... innovation is not just a new understanding or the discovery of a new phenomenon, not just a flash of creative invention, not just the development of a new product or manufacturing process, nor is it simply the creation of new capital and consumer markets. Rather, innovation involves related creative activity in all these areas."

Reviewing the literature suggests that researchers have been highly creative in defining creativity: Gregory was able to cull no less than fifteen conceptions of creativity and forty-two theories or mechanisms of creative behaviours.[5] The various tentative approaches fall into three categories: objective, subjective, or normative definitions.

Objective definitions concentrate on the environmental circumstances which lead to creative behaviour. Miller and Starr's statement is particularly representative of this school: the creative act is called for "when the saddle point in a payoff matrix

is negative," that is to say, when the best that can be done is inevitably a loss.[6]

Subjective definitions are inevitably rendered tautological by their reference to "novelty", and may well be represented by Drevdahl's contention that "creativity is the capacity of persons to produce compositions, products, or ideas of any sort... essentially new or novel, and previously unknown to the producer."[7]

Normative definitions put emphasis on value and utility, as is obvious in Haefele's opinion that "high creativity is the ability to make innovations of specially great social worth."[8]

Whatever the viewpoint on creativity, the concept is fundamental to the generation of ideas, as the study of exploration models indicates.

1.1.2. Models of Exploration

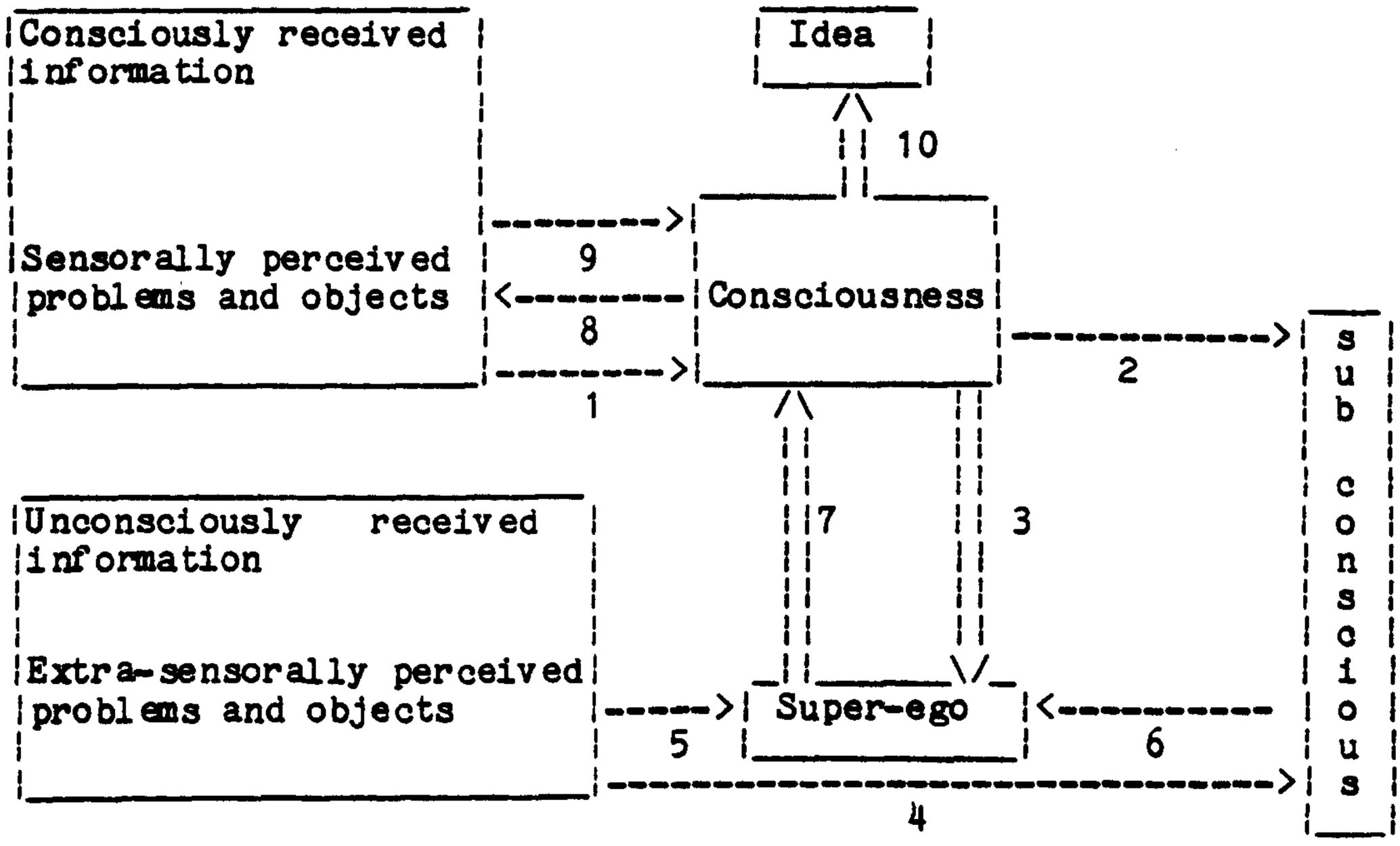
Models and methods for idea generation must be distinguished: models attempt to unravel the process of idea generation, while techniques are aimed at suggesting propitious series of actions whose combinations may result in new ideas.

Three models will be reviewed to increase understanding of the complexity of the problem.

1.1.2.1. The Perception Model

The perceptual model developed by Gulas[9] involves both sensory and extra-sensory perceptions, as shown in Fig.12.

Fig.12- Model for idea generation involving sensory and extra-sensory perceptions



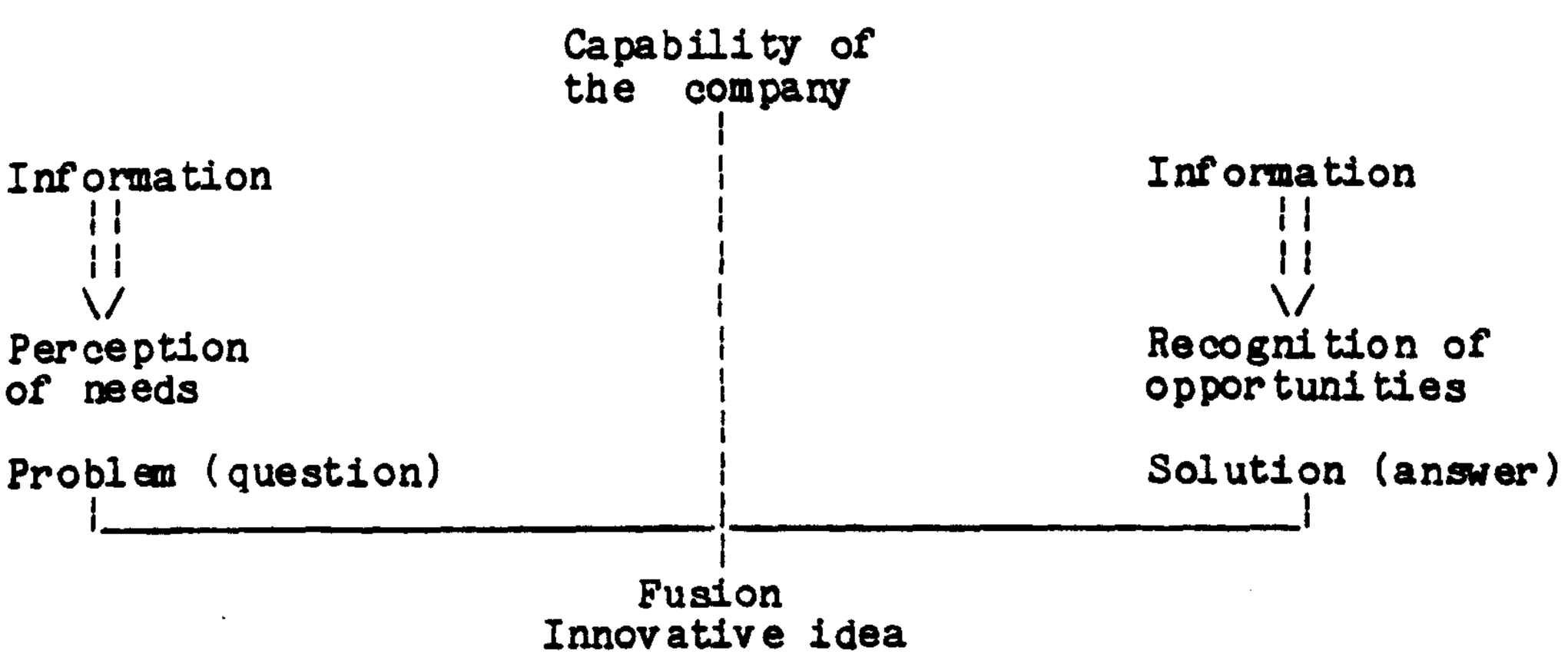
A problem is recognised through consciously received information (1) and forwarded into the sub-conscious (2) and the super-ego (3). The sub-conscious mind is important since the nucleus of creativity, intuitive thinking, is said to take place here.[10] Intuition is viewed as the ability to conceive the whole without knowing all of its parts. This process is said to be typical in the creative individual who is able to substitute missing conscious information by sub-conscious information or by unconsciously received information (4) through extra-sensory perception. The super-ego, which also receives external information unconsciously (5) has a controlling function on the thinking processes; it acts as a moral or preventive filter derived from acknowledged authorities, accepted norms, etc. The filtered intuitive idea for solution (7) appears in the conscious mind (illumination) where it is verified by local thinking involving interaction between the problem and the idea (8) and (9). Output of the process (10) is the verified intuitive idea. What can be

deduced from this model is that the creative process cannot be managed as a physical phenomenon. Consequently, it is not possible to determine the time required for the conscious and unconscious thinking processes on the sole basis of existing knowledge, and the output of creative thinking therefore cannot be scheduled in advance.

1.1.2.2. The Fusion Model

A model of the idea generation process, where information is a key concept, is shown in Fig.13. Conceptualised by Holt, this model is based on the assumption that "an innovative idea emerges as a fusion of a perceived need with the recognition of a technical opportunity."[11]

Fig.13- Model of idea generation as a fusion of needs and opportunities



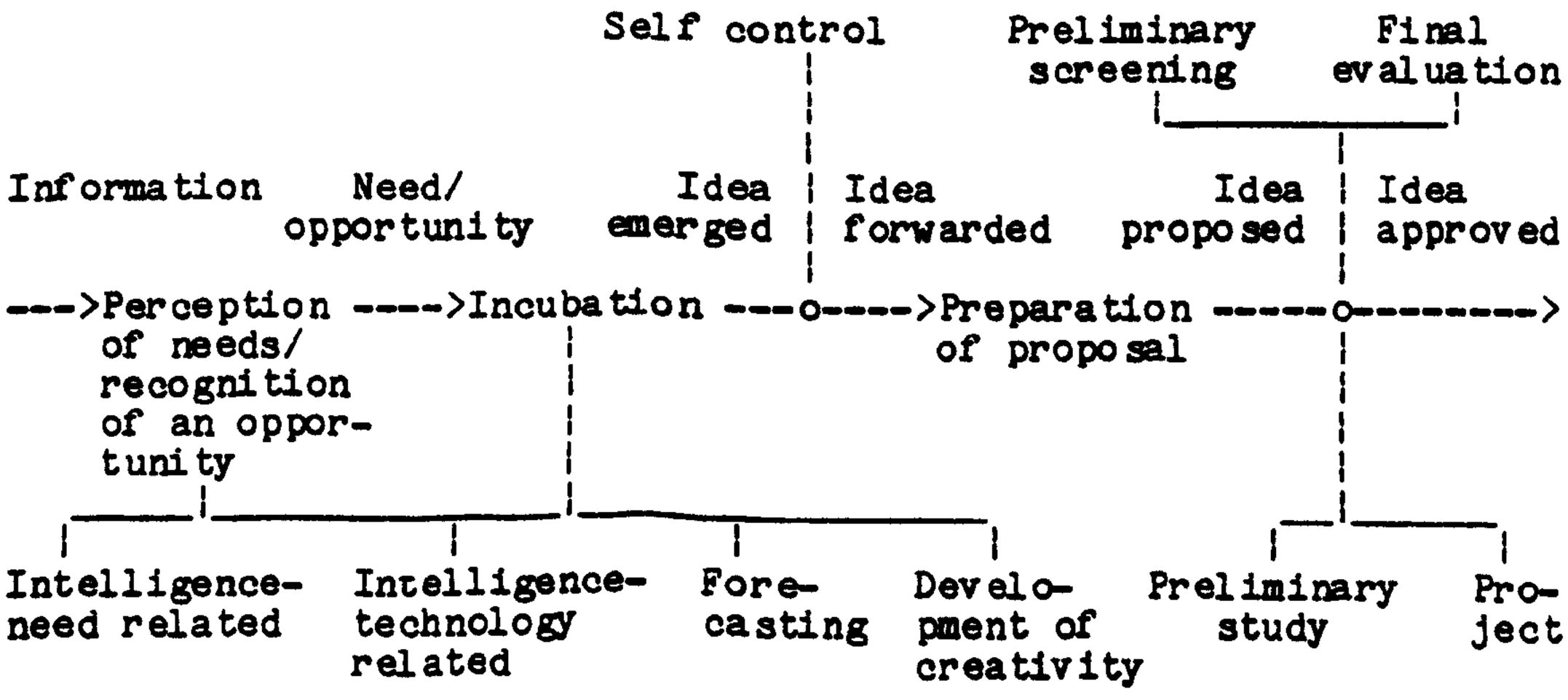
The definition of the problem will depend on the perceived need, which again depends on the kind of information which the problem-solver is exposed to, while the solution of the problem will emerge as a technological opportunity, the character of which is dependent on the type of received information. The capability of the company is viewed as influencing the generation of the idea, but the initiation of the idea may be done by perceiving a need or by

recognising an opportunity. In this respect, the model addresses the issue of "pull" versus "push" approaches. The operational aspect of this model is bounded by two over- simplifications: (i) information is reduced to neutral communication of objective requirements, and (ii) the solution is viewed as a mere technological opportunity. These assumptions neglect the strategic aspect of information and oppportunities within organisations, and have already been discussed (see 1.1.1.4. and 1.2.1. in Chapter III).

1.1.2.3. The Flow Model

Fig.14 shows a model of idea generation designed around a horizontal flow line.[12] The information input to the process refers either to a technical opportunity, or to the perception of an existing or latent user need.

Fig.14- Model of idea generation designed around a flow line



This information may be received or collected more or less systematically. At this stage, problems of clarification may trigger several subconscious processes which take place during the

next step, the incubation period. The problem is here dropped for some time from the conscious level. Sooner or later, a solution is found, resulting in the creation of an idea that emerges from the subconscious to the conscious level. This idea represents a synthesis of the need and the solution(s). Among the ideas that emerge, some are forwarded to the appropriate body for further consideration. The next step is a preliminary screening where ideas which are not consistent with the objectives and policies of the company are dropped. The remaining ideas are investigated through a preliminary study in order to get a better basis for final evaluation. The outcome of this evaluation determines whether the idea will be dropped, postponed, or further utilised.

Again, this model bears the hallmark of the technological rationality. The process is reduced to a series of formal, neutral and purely logical phases at the end of which approved ideas emerge as the most "useful" for the company, thought of as a combination of technological abilities and requirements. The limits of such a conception have been previously pointed out: by neglecting the strategic aspect of most of the organisational phenomena and the variety of the actors' rationalities, one is led to resort to artificial models of limited practical interest.

However, a number of tools are available to those who are participating in the idea generation process. These tools are examined below.

1.1.3. Methods of Exploration

According to Baker, the exploration phase may be structured, unstructured, or serendipitous.[13] A structured procedure for new product ideas may be based on market research into consumer reactions both to the company's own products and to those of the

company's competitors "in order to give early warning of failing interest or dissatisfaction or, more positively, to suggest areas for improvement which will enhance the product's standing with its target audience."[14] According to Baker, unstructured idea generation tends to be more typical of firms with a single product or small range of products experiencing a decline in their current profitability: the firm does not have a formal new product development function but operates on an ad hoc basis. Serendipity happens when ideas for new products occur by chance. Various methods have been designed for the generation of ideas, and are discussed below.

1.1.3.1. Morphological Techniques

Morphological techniques are a way of helping to generate design proposals, and concentrate on the form of the design rather than on the "mind" of the designer. The morphological approach is associated with the name of Zwicky[15] and has been described by Watts[16]. Morphological techniques are analytic aids to creativity which assure that all possible solutions to a problem are enumerated through a systematic breakdown of the problem into parts which can be treated independently.

Morphological techniques aim at finding new solutions to a given problem by obtaining a proper appraisal of all the facts ("boundary conditions") needed for the unbiased deduction of possible solutions. Morphological analysis consists of the following steps:

(i) Defining and structuring the problem. The problem to be solved must be formulated concisely in terms of all the characteristic parameters that might be of importance for the solution of the problem.

(ii) The morphological box. The parameters are analysed, and for

each parameter as many significantly distinct values (solutions or approaches) as possible are devised. The number of overall solutions to the original problem is obtained by enumerating all possible combinations of the different values of the different parameters.

(iii) Stepwise screening of the best overall solutions. One might start systematically to rule out all solutions which are not feasible because of interactions between values on different parameters. Then, one must evaluate the performance value of each solution with respect to the purposes that are to be achieved, and choose the optimally suitable solutions.

(iv) Random access to improved solutions. One might start from already known solutions or from what promise to be interesting solutions: the performance criteria may be applied to determine whether improved solutions could be found in the neighbourhood, that is, by changing the values of one or few parameters.

As far as areas of application are concerned, morphological techniques are used to identify all possible devices to achieve a functional capability; to structure and organise thinking about a problem in such a way that new information is generated; to generate branches in a relevance tree or reference scenarios when writing scenarios.

Morphological analysis is often described as a technological forecasting, because of its ability to suggest future technological advances. However, most of the practical applications have been in the identification of possible design configurations and as such it may more properly be regarded as a technique for generating new ideas for the solution of practical technological problems, as suggested by Jantsch[17], Nicholson[18] and Bridgewater[19].

1.1.3.2. Needs Research

There are a number of ways in which the needs of the user can be analysed systematically to yield ideas for new products. According to Twiss, needs research is a term applied to the analysis of complex technological systems incorporating a large number of subsystems.[20] Therefore, this method does not aim at replacing the total system. Rather, advances are made by the improvement of subsystem performances. Accordingly, it is crucial in a problem of this nature that R & D investment and commitment are devoted to that part of the total system where it will bring the ultimate user the maximum benefit.

In sum, needs research is a modelling technique which enables a thorough investigation of the total system performance, in relation to forecasted user needs to be made in respect of alternative investments in improvements of the subsystems which comprise it.

The important features of needs research are identified by Twiss as follows:[21]

(i) The analysis starts with the user's needs;

(ii) The use of technological forecasting to forecast these needs at some future period;

(iii) The employment of a modelling technique to relate subsystem and system performance in relation to these needs;

(iv) The experimental determination of where investment can yield the best results before a project is defined.

1.1.3.3. Technology Monitoring

If, according to Twiss, "most managers receive their information inputs haphazardly, from reading, discussions, conferences, etc.,"

monitoring the technological environment demands a systematic approach.[22] According to Bright, monitoring includes much more than simply "scanning": it includes search, consideration of alternative possibilities, and their effects, and a conclusion based on evaluation of progress and its implications.[23] Then, technology monitoring may provide a systematic basis for the collection and recording of information which is in effect a wide ranging surveillance system of relevant sources.[24]

This method's primary purpose is to direct attention to areas where a new development combined with existing knowledge makes possible an innovation. Therefore, a valuable by-product of monitoring can be the random association of these facts during the review process which is unlikely to occur outside the formal framework.

Techniques such as morphological analysis, needs research, and technology monitoring may be completed by behavioural techniques for collective problem-solving, which are reviewed below.

1.1.3.4. Brainstorming

Holt defines brainstorming as a "method for creative thinking based on free association and deferred judgment."[25] The purpose of brainstorming is to generate within a short time a large quantity of ideas, among which there will be some fitted for further use. Briefly, brainstorming is a technique by means of which deliberate alterations of normal thought processes are injected into a group of people so that they do not attempt to think imaginatively and critically at the same time.[26] With regard to the areas of application, the value of brainstorming in solving technical problems is generally thought to be limited.[27] However, it has been reported by Rickards that about half a sample of twenty

brainstorming sessions he investigated in an R & D environment produced utilisable results.[28]

1.1.3.5. Synectics

"Synectics" is a word coined by Gordon to describe the structured group technique he devised for achieving a creative problem-solving climate.[29] Synectics may be defined as a "method for creative problem-solving where one attempts to stimulate the thinking processes which individuals are using when they are most creative."[30] Synectics is based upon the theory that the probability of problem-solving success is increased by an understanding of the emotional and irrational components of the creative process which are considered more important than the intellectual and rational elements. The real purpose of this technique is to identify good solutions by restructuring the problem and by achieving freedom from constraints, elimination of negative responses, deferred judgment and escape from the boundaries imposed by traditional thought patterns. According to Gregory, a typical synectics session is conducted by having a group of about five to seven people.[31] A leader for the group is chosen but is not allowed to contribute ideas of his own. Rather, he is responsive to all contributions made by the group members. The group should include at least one expert in the field of the problem posed. The procedure followed is firstly for the leader to state the problem; then the expert will answer all questions asked by the group and react to ideas advanced by them. This process is intended to remove any misconceptions and produce useful ideas. In the next phase, each member of the group formulates a set of problems arising from the previous phase: the leader chooses one of these and enunciates a key concept. Then, the group will try to think of as

many analogies to the key concept as possible. After some period of searching for such analogies, the leader starts the terminal phase by trying to apply some of the unrelated concepts to the problem posed.

The rationale of this technique is explained at length by Prince who illustrates the theoretical methodology with transcripts from actual cases.[32]

1.1.3.6. Lateral Thinking

Edward de Bono uses the term "lateral thinking" to describe the characteristics of creative imaginative thought which distinguish it from the traditional logical approach he calls "vertical thinking".[33] He stresses the importance of patterns in shaping ideas. Patterns are briefly defined: "where any state is preferentially followed by another state, that is a pattern."[34] These patterns are independent of the sequence in which information arrives. By breaking existing patterns, which process information, one may re-order or "re-pattern" information, in order to think creatively and generate new ideas.

De Bono suggests that before searching for new ideas, it is useful to examine current ideas and identify the major influences giving shape to them: "once the ideas have been recognised, then one moves naturally to ways of changing them or escaping from them."[35] Various techniques (such as "discontinuity", for example) have been designed, which help to change such patterns.

As regards the areas of application of lateral thinking, this approach has been used in the development of new products and new ideas, in problem solving and in identifying possible simplifications and cost cutting in organisations.

The techniques which are reviewed above aim at magnifying

creativity, in order to improve the process of idea generation. However, the generation of ideas is but the first stage of a sequence which involves other crucial phases, as indicated below.

1.2. Intermediate Phases within the Addressing System

The intermediate phases of the development of a new product encompass screening, business analysis, development, and testing.

Screening follows the exploration phase, and takes place in order to ensure that further, and costly, studies will be devoted only to promising ideas. According to Baker, "screening is an essentially subjective procedure in which managers use their knowledge and experience to weed out the obvious non-starters."[36]

The next phase is that of business analysis, which aims at assessing each of the "possible" ideas in terms of its technology and its compatibility with the production system, its marketability and its competitiveness, and finally in terms of the financial implications of proceeding with it further.[37]

The following phase, i.e. technical development, deals with establishing if it is physically possible to produce an object that satisfies both technological and cost constraints. According to Baker, it is vitally important, in this phase, to "observe events and changes in the proposed target market [in order to] update the product concept to reflect changes in the market."[38]

The test phase may proceed in parallel with the development phase, or be a separate activity. For complex products involving advanced technology and/or radical behavioural change, it is important that deficiencies and defects in the final product are identified while it is still possible to rectify development and design adapted improvements. For less sophisticated products, which can be readily imitated and developed, testing may result in

the risk of "giving the game away to one's competitors" and allow them to counter one's full- scale launch with a quick and unexpected competitive reaction.[39]

At this stage, a question must be raised, which may seem deceptively trivial: How is it possible that new ideas can be applied to the market ? This supposes that the conceptions formed within the addressing system are generalisable to addressed systems. Actually, this can happen only if there exists a subsystem which is common to the addressing system and the addressed systems. Generally, it is assumed that this common subsystem is composed of: (i) technological and economic variables, and (ii) rationality, that is, the way in which technological and economic variables are related in a logical structure.

Since technology rests both on the laws of fundamental sciences such as mathematics, physics, chemistry, or biology, and those of applied sciences such as engineering, it is legimate to assume the equivalence of technological conceptions within the addressing system and the addressed system.

Similarly, the fixed principles of economics, and their general application to accounting and finance practices enable the addressing system to make valid assumptions about the addressed systems and their reactions to ideas and products generated in the addressing system.

However, technology and economics are modes: they are not substances. They are used in order to express in a formal and operational order substances such as resources, constraints, needs, requirements, and objectives (the distinction between modes and substances is the classical one: the substance is what underlies the phenomena; modes are accidental modifications of the substances). The heart of the matter lies in these substances themselves, not in the tools used in communicating them. The tools

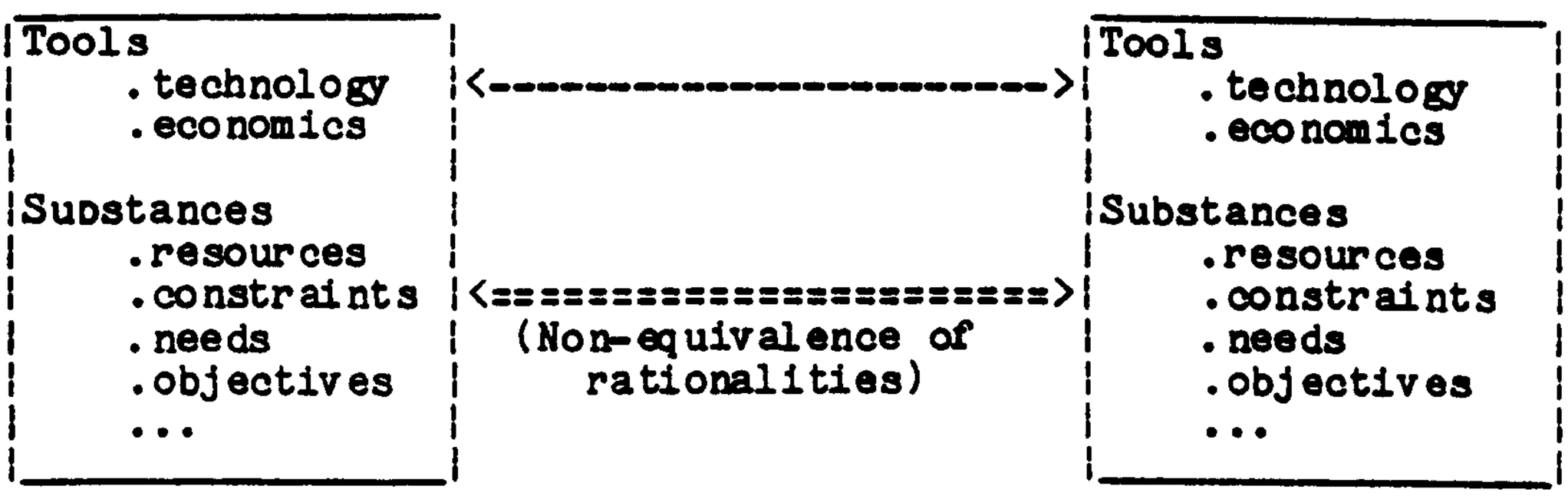
are common to the systems (i.e., innovator and potential adopter), but they are not sufficient indications of the systems' reactions.

Therefore, an interesting piece of information would be one that refers to the substances themselves and the way they are experienced in the addressed systems: the phenomenological approach tackles this problem. Rationality is the name given to the principle which structures these substances. The addressing system (e.g., innovator) takes a risk as soon as it makes a priori assumptions about this rationality. The framework within which the substances (e.g., needs, resources, objectives, etc.) are expressed may well be of the techno-economic type; but this does not mean ipso facto that the substances themselves are structured and experienced by the same rationalities, and that these rationalities are of the techno-economic order (even within the innovator's system, of course). Actually, organisational studies suggest that rationality may be of various types. Moreover, nothing indicates that there exists an overall organisational rationality, rather than a constellation of individual rationalities within the systems. In this respect, one may wonder whether such a priori assumptions about rationality within addressed systems may not limit the chances of success of new products.

The problem of the variety of rationalities is examined in Chapter V. However, the equivalence of subsystems within the addressing and the addressed systems is not enough. This is a necessary but not a sufficient condition for an advantageous and profitable relationship between the two systems. As Fig.15 indicates, this relationship must rest on an adequate support, or vector. The nature of this vector raises the question of commercialisation, which will be dealt with below.

Fig.15- Equivalence and non-equivalence between addressing and addressed systems

------ Valid a priori extrapolation of equivalence
====== Invalid a priori extrapolation of equivalence



1.3. The Problem of the Vector between the Addressing and the Addressed Systems: Commercialisation

The final phase of the new product development process is commercialisation, when the product is launched in the market. It is during this phase that a commercial relationship is developed between the addressing and the addressed systems. The importance of this commercial vector has been already underscored, when it was characterised as a necessary (although not sufficient) condition of a successful development process. However, as noted by Baker, "this stage rarely receives equal treatment with the preceding phases and attracts comparatively little attention."[40] A reason for this may be the general assumption that if one has competently carried out the procedures recommended by the normative theory of innovation, then failures in commercialisation will only result because of the unexpected intrusion of factors outwith the addressing system's control.[41] A review of success and failure in the commercialisation of new industrial products leads one to reject this interpretation. Before examining empirical findings, it is important to define the concepts of success and failure.

1.3.1. Failure and Success: Definitions

An objective and universal criterion of success and failure in the commercialisation of new industrial products seems very unlikely to be found. There is an obvious reason for this: either the firm has some predetermined sales (or market share) target against which it can measure the product performance, or nothing like this exists and only the subjective judgment of the innovator will decide whether the product is a success or a failure. In either case, the criterion is not generalisable to other circumstances: the targets of reference will differ, and the subjective judgment will vary. Baker emphasised this difficulty of objectively defining failure and success when he wrote:[42]

> "It would seem that we cannot define a common denominator with which we may judge 'success' and 'failures', and that we must accept that a new product has failed when its originator comes to this conclusion based on his own criteria."

In other words:[43]

> "... the only sure test of success or failure [is] the subjective criteria of the firm's own perception and... no external, objective measure is available which can be applied accross the board."

Although this viewpoint is both widely accepted and satisfactory on an epistemological basis, it must be acknowledged that its fluidity limits the validity of the conclusions that could be drawn from comparisons of empirical findings.

1.3.2. Empirical Findings Related to Success and Failure in Commercialisation

A number of studies have appeared during recent years about the determinants of new industrial product failures. These studies are

mainly of three types:

(i) Case analysis of some new industrial products that emerged successfully from R & D progams only to become market failures (Briscoe,[44] Baker[45]);

(ii) Cross-sectional studies of new industrial product failures (Cooper,[46] Calantone and Cooper,[47] Hopkins and Bailey,[48] von Hippel[49]);

(iii) Experimental or quasi-experimental studies that focus on differences between successful and unsuccessful innovations competing in the same market (Rothwell et al.[50]) or on factors influencing new product success probabilities (Mansfield and Wagner[51]).

This categorisation is based on Choffray and Lilien's works, on which the following lines draw substantially (see note 71). The above studies converge to point out the following causes of failure:

(i) The lack of appreciation of the way customers perceive and evaluate the new product;

(ii) The misassessment of the firm's existing stock of resources, especially its market skills;

(iii) The lack of specific objectives for the new product in terms of its target market and place in the company's product mix.

Mansfield and Wagner have investigated the success probabilities of new industrial products in different stages of their development cycle. They reported:[52]

(i) 65% rate of commercialisation, bringing the product to market, following successful technical completion (57% rate of technical completion, i.e., the development of a working product prototype);

(ii) 74% probability of economic success after commercialisation.

This leads to a 27% commercial success rate for industrial product development projects. Although this number should be interpreted carefully because of sample size considerations and lack of agreement about what a commercial success is (see 1.3.1.), it provides a gross estimate of the risks associated with new product development activities in industrial market. Table 1 gives similar estimates by Booz Allen & Hamilton.[53]

Table 1- Rates of commercial success for new industrial projects

	Rates of commercial success for:	
	Product development projects	New products introduced
Chemical	.18	.59
Electrical machinery	.13	.63
Metal fabricators	.11	.71
Non-electrical machinery	.21	.59
Raw material processors	.14	.59
Average	.15	.62

In their analysis of organisational and strategic factors associated with the probabilities of success in new industrial product development, Mansfield and Wagner relate the probability of commercialisation and economic success to three key variables:[54]

(i) Earliness of market analysis;

(ii) Percentage of money spent on demand pull (as opposed to technology push) projects;

(iii) Percentage of projects originating in R & D.

These results show that early market analysis improves success rates. The percentage of demand pull projects is positively correlated to probabilities of technical completion and commercialisation but not, interestingly, to the likelihood of economic success. The probability of technical completion is

negatively correlated to the percentage of projects stemming from R & D departments. This could suggest that R & D departments tend to support projects that are more ambitious and, thus, less likely to reach technical completion. However, economic success is greater, given technical completion with ambitious R & D-originated products. The lesson of this analysis seems to be: perform market analysis early and consider a portfolio of market-based and R & D-based products to maximise both success and company growth. Table 2 summarises these results.

Table 2- Summary of key relationships associated with product success. (From Mansfield and Wagner, note 51)

	Early analysis	Percent demand pull	R & D source
Probability of technical completion	+	+	-
Probability of commercialisation	+	+	
Probability of economic success	+		+

Cooper's 1975 report on the causes of failure of 114 new industrial products shows the extent to which resource deficiencies contributed to product failures.[55] Table 3 provides a summary of these findings.

Table 3- Resource deficiencies and product failure. (From Cooper, note 55)

	Percent of product failures		
Resource deficiency	Very much	Somewhat	very much plus somewhat
Lack of financial R.	5.5(6)	17.3(6)	22.5(6)
Lack of engineering S. or P.	8.2(4)	32.7(3)	40.9(4)
Lack of R & D S. or P.	7.3(5)	30.0(5)	37.3(5)
Lack of marketing research S. or P.	21.6(1)	43.2(1)	64.8(1)
Lack of general management S.	9.0(3)	42.1(2)	51.1(2)
Lack of production R. or S.	4.5(7)	15.3(7)	19.8(7)
Lack of selling R. or S.	13.5(2)	32.4(4)	45.9(3)

[Numbers in parentheses indicate rank in each column. "R." stands for "resources"; "S." stands for "skills"; "P." stands for "people".]

The high score of "lack of general management skills" in the table above is not surprising. Much more interesting is the importance of "marketing research" and "selling".

These factors are all the more critical as they should be considered as dependent, since one of the objectives of market research is to help orientating selling efforts.

From a different perspective, Calentone and Cooper provide an empirically based description of new industrial products failures, along with a profile of the major causes of these failures. They distinguish:[56]

(i) Sales and competition environment misassessment;
(ii) Deficient prior market research;
(iii) Deficient engineering and marketing skills;
(iv) Lack of integration of the new product/technology into the company's experience base.

Fig.16 gives their typology of new product failure (i.e., the kinds of situations most closely associated with new product failures).

Fig.16- A typology of new product failures
(From Calentone and Cooper, note 47)

Cluster I:	" The Better Mousetrap Nobody Wanted" (28% of the failures) Product failures in this group were unique products rejected by the market. The number of customers who might buy and use the product was over-estimated.
Cluster II:	" The Me-Too Product Meeting a Competitive Brick Wall" (24% of the failures) These products were similar to those already on the market. The market was correctly assessed, but the ease of dislodging competition was over-estimated.
Cluster III:	"Competitive One-Upmanship" (13% of the failures) These are me-too products hit by concurrent competitive entry. Thorough market studies and market testing were difficult - the product was not prepared to withstand competitive pressure.
Cluster IV:	"Environmental Ignorance" (7% of the failures) Products here were not matched with customer needs. There was a complete misreading of the environment: customers, competitors, and government.
Cluster V:	"Technical 'Dog' Products" (15% of the failures) These were bad products - they did not do what they were supposed to do. Poor R & D were blamed.
Cluster VI:	"The Price Crunch" (13% of the failures) The product was being offered at prices higher than customers were willing to pay. When the product was introduced, competition cut prices.

One problem arises from this typology: nothing is said about failures due to commercialisation deficiencies. This is surprising since, according to Cooper (see Table 3) shortcomings in commercialisation may rank second in the causes for product failures.

How can these two viewpoints be reconciled ? A tentative answer could be expressed as follows: commercialisation is the conclusive phase, and, accordingly, may be considered as a mere yes/no test of success or failure of the new product development. A "no" (failure) is therefore interpreted in relation with the preceding phases and explained in the light of alleged deficiencies during these phases. Deficiencies during the commercialisation phase itself are not taken into consideration in the typology.

Von Hippel has studied the source of several successful industrial products and processes innovations, and reported the influence of customer requests upon industrial new product development.

Actually, his results point out that in industrial markets, innovation users are frequently the source of successful new industrial products, as Table 4 indicates.

Table 4- The influence of customer requests on new product development. (From von Hippel, note 49)

Study	Type of innovation	N	Data available regarding presence of customer requests
A- Studies of Industrial Products			
Meadows (58)	Chemical products.	29	9 of 17 (53%) commercially successful projects ideas were from customers.
Peplow (59)	Plant processes, process equipment and techniques.	94	30 of 48 (62%) successfully implemented projects were initiated in response to direct customers request.
von Hippel (60)	Innovative process equipment.	49	Source of initiative for manufacture of equipment developed by users (N=29) examined. Source clearly identified as customer request in 21% of cases. In 46% of cases frequent customer-manufacturer interaction made source of initiative unclear.
Berger (61)	Engineering plastics.	5	No project initiating request from customer found.
Boyden (62)	Plastic additives.	16	No project- initiating request from customers found.
Utterback (63)	Scientific instrument innovations.	32	75% initiated in response to need input. When need input originated outside product manufacturer (57%) source was most often customer.
Robinson (64)	Standard and non-standard industrial products	NA	Customers recognise need, define functional requirements and specific goods and services needed before contacting suppliers.

Table 4- Contd.

B- Sudies of Research-Engineering Interaction			
Isenson (65)	R & D accomplishments judged key to successful development of 20 weapon systems.	710	85% initiated in response to description of problem by application-engineering group.
Material advisory board (66)	Materials innovations "believed to be the result of research-engineering interactions."	10	In almost all cases the individual with a well-defined need initiated the communications with the basic researchers.

On the basis of his observations, von Hippel proposes three paradigms for industrial product development. They are reproduced in Fig.17.

Fig.17- Three proposed paradigms for industrial product generation. (From von Hippel, note 49)

Paradigm	Sequence of activities					Universe of standard industrial products
Customer-active	product request from customer	--->	"custom" industrial product	--->	adoption by others	--->
Manufacturer-active	needs research by mfr	--->	idea generation	--->	idea testing	--->
Unfilled "known need"	"generally known" user need	--->	advance in technology	--->	development of responsive product	--->

The first paradigm, Customer-active, reflects a situation in which customer surveillance is most likely to yield an efficient stream of potentially successful new products ideas. The Manufacturer-active paradigm is the conventional approach, in which needs inferred through market research are considered as most likely to yield a new product success. The third paradigm reflects a situation in which "everyone knows" what the customer wants but an R & D breakthrough is required before the desired product can be

achieved.

Clearly, the Customer-active paradigm is aimed at solving the problem of the compatibility between the addressing and the addressed systems in a revolutionary way: that of transforming the addressed system (potential users) into a self-addressing, or auto-addressed system, via the manufacturer of the innovation, as Fig. 18 indicates.

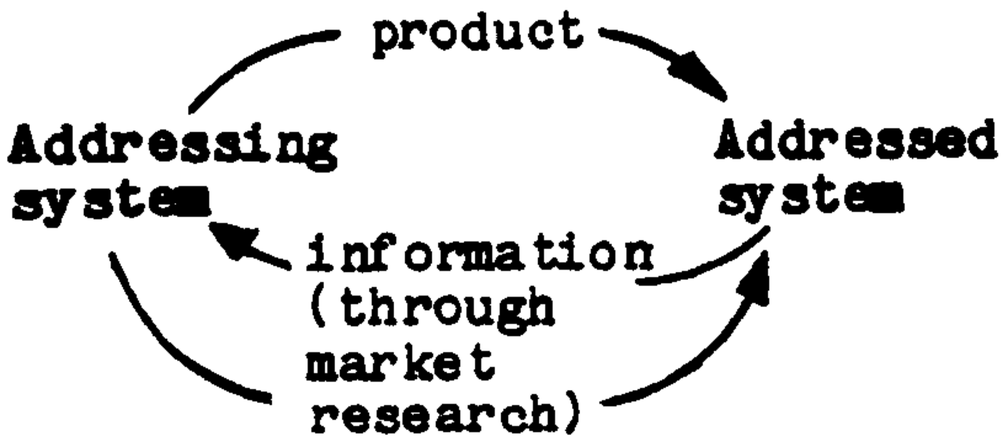
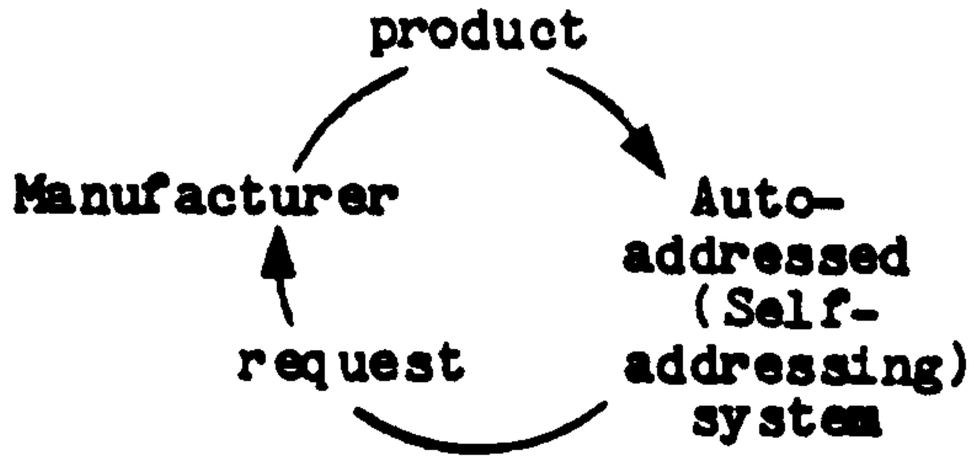


Fig. 18- Conventional and Customer-active paradigms



In fact, von Hippel's Customer-active paradigm is a second-order pull strategy: the point for the manufacturer is not so much to understand the potential customers' needs, as to convince the potential customers to express their needs to him. The manufacturer must sell himself as an adequate potential "satisfier" of the requests. Accordingly, the problem of the relevant vector of commercialisation between the two systems is solved ipso facto, since the new product is virtually "made to order". However, one may wonder whether the problem of commercialisation has not been merely translated from the post- manufacturing phase to that of pre-manufacturing: the manufacturer, if he wants to manufacture, must sell his ability to satisfy the customer's request. On the other hand, the issue of the Customer-active paradigm must be related to a broader perspective, that of the Interaction Approach.

1.3.3. The Interaction Approach

The Interaction Approach is closely related to both "inter-organisational theories" and the "new institutionalists". The Interaction Approach views the organisation as part of a group of interacting units: in order to obtain necessary inputs (human, material or financial resources), the organisation is seen to develop relationships with a number of other organisational units and thus it enters into a network of relationships.[67] The "new institutionalists" as Williamson has it, take the view that there are two alternative ways in which the exchange, or transaction, may be handled between technologically separable units in a production or transformation process: the transaction can take place either within a market setting, or be internalised in one organisational unit (a hierarchy), i.e. two successive stages in the production process are vertically integrated in a hierarchically built organisation.[68] The factors which favour the internalisation of transactions are identified as the following:

(i) The coordination of separate organisations by means of market relations may be hindered by the complexity and uncertainty of environment: viable contracts are rendered very costly to design.

(ii) The parties to such transaction may become very dependent on each other: imbalanced dependence between the parties gives rise to opportunistic strategies.

(iii) Information parity between separate organisations is difficult to achieve: "fair" deals are, therefore, impossible.

(iv) Conflicts are considered to be settled in a more efficient and less costly way within an organisation, and sequential, adaptative decision-making is facilitated.

The factors which keep the transactions in the market and which

counteract their internalisation are the following:

(i) Markets often do not operate as rigidly, and organisations do not operate as smoothly as depicted in the idealised extreme models, and thus transaction costs increase.

(ii) Imbalances are not always exploited in the short term in a way that increases the transaction costs.

The Interaction Approach is based on both these theoretical constructs and the following idea:

(i) Both buyer and seller are interactive participants in the market: each may engage in the search to find a suitable buyer or seller, to prepare specifications of requirements or offerings and to manipulate or attempt to control the transaction process.

(ii) The relationship between buyer and seller is frequently long term, close and involving a complex pattern of interaction between and within each company. The marketers' and buyers' task in this case may have more to do with maintaining these relationships than with making a straight forward sale or purchase.

(iii) The links between buyer and seller often become institutionalised into a set of roles that each party expects the other to perform. These processes may require significant adaptations in organisation or operation by either or both companies.

(iv) Close relationships are often considered in the context of continuous raw material or component supply.[69]

Accordingly, the marketing and purchasing of an industrial good may be seen as an interaction process between two parties in a certain environment. This way of depicting industrial marketing

and purchasing involves four basic elements:

(i) The interaction process;

(ii) The participants in the interaction process;

(iii) The environment within which interaction takes place;

(iv) The atmosphere affecting and affected by the interaction.

As a conclusion, and in the perspective of the present research, it can be said that the Interaction Approach provides a broad theoretical framework for marketing strategies. In this respect, the Customer-active paradigm may be seen as based on non-internalised interaction.

Throughout the studies reviewed above, the problem of commercialisation seems not to have attracted a lot of interest on the part of the researchers. "Selling effort" is generally understood in quantitative terms (economic or human resources) rather than in qualitative terms (commercial strategy).

Baker has recently pointed out this relative neglect of commercialisation deficiencies as possible causes of failures of new industrial products.[70] As already suggested, a reason for this could be that any deficiency in the commercialisation phase may be seen as a consequence of some previous phases' deficiencies. This may be true, but, at least, these consequences and their bearing on the commercial process must be identified. This is an important question, and the present research is devoted to showing that the selling efforts towards companies of potential users may yield different outcomes (adoption, rejection, deferred decision) according to the characteristics (rationalities and strategies) of the organisational members to which these selling efforts are directed. This point is expanded in the following section.

CHAPTER IV

SECTION 2 THE ADOPTION PROCESS WITHIN THE ADDRESSED SYSTEM

This section concentrates on the buying behaviour of the innovator's target segment. At this point, as Choffray and Lilien have it, the question the innovator faces is: "How can we determine the likely purchase behaviour of our target customers?"[71] After reviewing the literature, Choffray and Lilien argue that answering this question supposes that the following issues have been addressed:[72]

(i) Need specification heterogeneity: potential customer organisations may differ in their need specification dimensions (i.e., in the criteria they use to specify their requirements);

(ii) Buying centre heterogeneity: potential customers may differ in the composition of their buying centre;

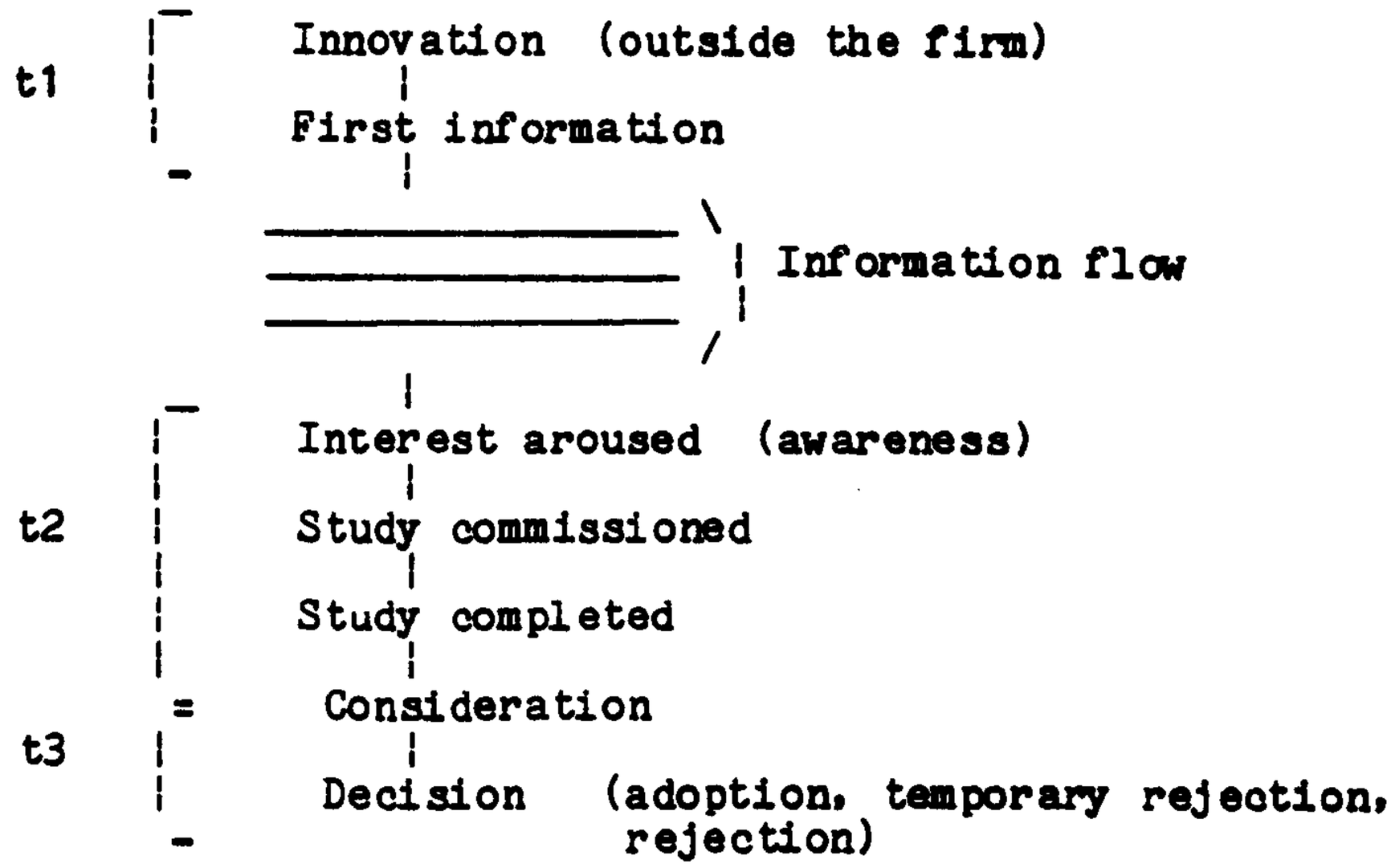
(iii) Evaluation criteria heterogeneity: decision participants may differ in their sources of information as well as in the number and nature of the criteria they use to assess alternatives.

In turn, these points raise the questions of: (i) the decision and adoption processes at the organisational level; (ii) the decision and adoption processes at the individual level; (iii) the segmentation of companies according to (i) and (ii). The following lines deal with these questions and suggest alternative perspectives.

2.1. The Organisational Level within the Addressed System

The prevailing theories of the adoption of innovation within a firm are well instanced in Nabseth and Ray's international study.[73] Fig.19 illustrates the process.

Fig.19- The internal process of adoption within a firm. (From Nabseth and Ray, op.cit.)



By t1, it is meant the time elapsed before the firm is reached by information related to the innovation. This time may vary, since information about a new technique, product, or process spreads through various channels and not all firms hear about the innovation simultaneously.

After the first information, more and more facts come into the firms about the advantages and limitations of the techniques from various sources: suppliers, competitors, the company's own R & D department, etc. The time elapsed between awareness and consideration (t2), is said to be a function of the firm's interest in innovation in general, operating conditions, and alertness of management.

The time elapsed between consideration and adoption (t3) is the time required for planning and realising the organisational adaptations that should be implemented in order to operate the innovation. Other approaches to organisational oriented models have been developed, and a summary of them may be found in Zaltman et al.'s comprehensive analysis of innovations and organisations.[74]

Fig.20- Organisational oriented models of the innovation process.(From Zaltman et al., op. cit., p.62)

Milo(75)	Shepard(76)	Hage and Aiken(77)
1.Conceptualisation	1.Idea generation	1.Evaluation
2.Tentative solution	2.Adoption	2.Initiation
3.Resource getting	3.Implementation	3.Implementation
4.Implementation		4.Routinisation

Wilson(78)	Zaltman, Duncan and Holbeck(79)
1.Conception of the change	I. Initiation Stage
2.Proposing of the change	1.Knowledge and awareness sub-stage
3.Adoption and implementation	2.Formation of attitudes towards the innovation sub-stage
	3.Decision sub-stage
	II. Implementation stage
	1.Initial implementation sub-stage
	2.Continued-sustained implementation sub-stage

Whether referring to situations where the innovation is generated within or outwith the firm, these models share some common factors. Moreover, the distinction between endo-generated and exo-generated innovations must not be over-rated, since all innovations have a common denominator: their relative novelty. If an innovation is viewed as "...any idea, practice, or material artifact perceived to be new by the relevant unit of adoption",[80] then it is not surprising that all these models start with a cognitive stage:[81]

> "Knowledge of the innovation is a crucial first sub-stage of initiation [and] before any innovation can take place or be adopted, potential adopters must be aware that the innovation exists and that there is an opportunity to utilise the innovation in the organisation."

These considerations suggest various remarks, which are indicated below.

2.1.1. The Ambiguity of Awareness

Most of the organisational oriented models of the innovation process

postulate an initial stage of awareness (from which stem "conceptualisation", "evaluation", "conception of the change", etc.). This concept, easily used at the individual level, is a problematic one when applied to organisations. When dealing with innovations generated outside the firm, awareness refers to the perception of some information about the environment, as the latter is more or less modified by the innovation. But environment is increasingly viewed as a powerful source of ambiguity for the organisation. According to March and Olsen,[82]

> "Environmental actions and events frequently are ambiguous. It is not clear what happened, or why it happened. Ambiguity may be inherent in the events, or be caused by the difficulties the participants [in the organisation] have in observing them. The complexity of, and change in, the environment often overpower our cognitive capacity. Furthermore, our interpretations are seldom based on our own observations; they rely heavily on the interpretations offered by others..., the degree of ambiguity will be strongly dependent upon the efficiency of the channels through which interpretations are transmitted."

Therefore, three points must be put forward:

(i) Organisational awareness may not be an immediate phenomenon: it may require the mediation of various (human) channels, characterised by various functions and expertises.

(ii) Organisational awareness may not be the outcome of a transcendental and disembodied process by means of which organisational members are made aware of an innovation: information may be interpreted and processed out of a complex environment.

(iii) Organisational environment may not be homogeneous: different information sources from the environment may reach different organisational members. Even the same source of information may reach various organisational sub-units (which may differ in their tasks, roles, objectives, education, etc.).

These points are of paramount importance if one considers the hypothesis that some organisational sub-units may be more likely to accept the innovation than others. At this stage, it is sufficient to suggest that the likelihood of acceptance may be related to individual or small group (sub-units) rationalities and strategies. The question of the various organisational rationalities and strategies is examined at length in Chapter V.

2.1.2. The Ambiguity of Relevance

When Zaltman et al. refer to the "relevant unit of adoption" in the definition quoted above, two questions may be raised:

(i) By unit, is it meant the whole organisation, or the sole department which is concerned by the innovation?
(ii) According to which criteria is the relevance to be ascribed (criteria of use, awareness, need, etc.)?

Consequently, four remarks may be pointed out:

(i) The relevance of the innovation to any potential unit of adoption may not be only a function of both the characteristics of the innovation and the "objective" characteristics (tasks and mission) of the organisational members: it may depend upon (a) the relationships between the organisational sub-units, (b) the potential effects of the innovation on these relationships, and (c) the rationalities and strategies of the sub-units;
(ii) Because of this ambiguity of relevance, any innovation may be seen as a source of uncertainty by organisational sub-units;
(iii) Because of the ambiguity of relevance and of its consequences, attempts may be made to reduce this ambiguity: tentative

definitions of the innovation may be suggested within the organisation.

(iv) These tentative definitions may give rise to power plays, inasmuch as by defining the innovation, one determines the kind of rationality which will apply to the problem and, therefore, points out the organisational sub-unit which will deal with the innovation.

2.1.3. The Ambiguity of Opportunity

The potential adopters' awareness of the innovation and of an opportunity to use it in the organisation is seen as a condition sine qua non of adoption. Actually, according to Zaltman et al., a major question here is "whether the awareness or knowledge of the innovation comes first, followed by the development of a need to innovate or vice-versa."[83] In this respect, Rogers and Shoemaker acknowledge that "... research does not provide a clear answer to this question of whether awareness of a need or awareness of an innovation (that creates the need) comes first."[84]

Obviously, to consider a potential need as an opportunity to use the innovation leads one into a vicious circle. A possible way to escape this vicious circle - and to solve the question raised by Rogers and Shoemaker - would be to stop considering "needs", "awareness", and "opportunities" in abstracto. Indeed, one may question the notions of organisational opportunities and needs, and replace them by the notion of a constellation of various organisational sub-units' opportunities and needs. Consequently, opportunities should be related to these sub-units' expectations, goals, expertises and strategies within the organisation. Cohen et al. suggest this view when they write that:[85]

> "A solution is somebody's product. A computer is not just a solution to problem in payroll management, discovered when needed. Despite the dictum that you cannot find the answer until you have formulated the question, you often do not know the question in organisational problem until you know the answer."

Accordingly, the following points may be suggested:

(i) Opportunities, or needs, may vary within the organisation;

(ii) Opportunities, or needs, may be ambiguous at the organisational level;

(iii) Opportunities may be related to the actors' strategies within the organisation.

Another common feature to the organisational oriented models of the innovation process is that of evaluation (cf., "decision sub-stage", "proposing of the change", "consideration", etc.). This concept is not any simpler than the previous ones.

2.1.4. The Ambiguity of Evaluation

In this sub-stage, the information concerning the potential innovation is evaluated. According to Zaltman et al.:[86]

> "At this point in the innovation process, the organisation needs to process a good deal of information. It is therefore necessary for the organisation to have effective channels of communication."

Such a viewpoint is heavily influenced by the cybernetic theory: information is viewed as a neutral stream of data, flowing through the organisation (see Chapter III, 1.1.1.4.). As previously examined, other schools propose alternative approaches: information can be retained, distorted, and may stand as a strategic asset for the organisational actors (see Chapter III, 1.2.1.). Accordingly, the following points should be considered:

(i) The information related to the innovation may be interpreted and altered throughout the organisation;

(ii) These interpretations and alterations may be related to the actors' rationalities and strategies, which are components of the organisational climate;

(iii) Therefore, the channels of the information may be of paramount importance as regards the outcome of the evaluation phase;

(iv) All the possible organisational conveyors (vectors) of this information may not have the same importance within the organisation: some may be more likely to influence the decision process than others;

(v) There may be some propitious vectors of information: some organisational sub-units maybe convey the information related to the innovation in a way more likely to result in its acceptance than others;

(vi) It is possible that these characteristics of the organisational information vectors may be related to their strategies and rationalities, as components of the organisational climate.

The models reviewed above contain other common features, but these are mainly related to the post-decision phases and, therefore, discussing them is not relevant to the present research.

The various points which have been underlined in 2.1. will give rise to research hypotheses. These hypotheses will be formulated in Chapter VI, after examining the concepts of strategies, rationalities and decision-making (which furnish the interface between organisational climate and the acceptance of innovation) in more detail in Chapter V.

The models discussed above focus on the organisational level of the innovative process. The unit of analysis is the firm, and this does not allow for an examination of individual influences on the

various sequences that lead to adopting or rejecting (temporarily or otherwise) the new industrial product or process under consideration. Consequently, a more complete understanding of the phenomenon of technological innovation adoption should be gained by taking into consideration organisational members' characteristics.

2.2. The Individual Level within the Addressed System

The following lines are aimed at enhancing the individual factors which are involved in industrial buying processes and the central concern is to assess some classical models of industrial buying behaviour in order to gain insights into the influences individuals may have on the organisational process. However, components other than those strictly related to individual influences will have to be characterised (e.g., environmental factors, product features, etc.) as they may modify these individual influences.

As regards the scope of analysis, three alternative approaches may be identified: the researcher may resort (i) to individual oriented models of adoption of innovation; or (ii) to models of industrial buyer behaviour; or (iii) to the few models of buying behaviour related to new industrial products. The first approach suffers from its over-generality: innovation is often thought of in terms of social or general organisational change. The third approach would be the most interesting one, but the small number of available models does not enable a sufficiently comprehensive judgment to be formed. The second approach will therefore be adopted, as it already deals with industrial products and, generally, takes into consideration organisational aspects. Attention will be focused upon models of industrial buyer behaviour and, when possible, emphasis will be placed on specificities resulting from innovation situations.

2.2.1. Integrated Conceptual Models

There exists a number of studies or researches reviewing models of industrial buying behaviour, but they generally lack coherence or simplicity.[87] The models aimed at describing, explaining or predicting industrial buying are quite different from the general models of consumer behaviour,[88] although their structure is a traditional one: inputs, outputs, black box, and a set of exogeneous factors.

2.2.1.1. Robinson and Faris' Model: Buygrid

Robinson and Faris have developed a descriptive model of industrial buying behaviour which categorises this process according to purchase situations.[89] Basically, the Buygrid model is a classification of the process phases, which are summarised as follows:

(i) Problem awareness,
(ii) Determination of the product to buy (characteristics and quantities),
(iii) Search and evaluation of the potential suppliers,
(iv) Collection and analysis of the proposals,
(v) Evaluation of the proposals and choice of the suppliers,
(vi) Selection of the order procedure,
(vii) Control.

Buygrid is interesting inasmuch as a distinction between purchase situations may prove useful in terms of strategy. The major shortcoming of the model is that it is not sufficiently comprehensive. The model neglects the influence of organisational or

environmental variables on the industrial buyer's behaviour and does not allow for an analysis of the buying centre organisation.[90]

2.2.1.2. Webster and Wind's Model

Conversely, this analysis is at the core of the model of industrial buying behaviour which has been designed by Webster and Wind.[91] They suggest that the buying process may be thought of as a decision-making process liable to be notationally expressed as follows:

BB= f(I,G,O,E), where
BB= buying behaviour;
I= individual characteristics of the buying centre, including their personality, motivations, cognitive and preference structures;
G= interpersonal relationships between the buying centre members (users, advisers, decision-makers, filters) with respect to the problem under consideration, or, generally, interactions, structures of the group and its leadership models;
O= organisational characteristics related to the problem in question (technology, structures, etc.);
E= environmental factors (economic, legal, techno-logical ...).

The model may be read as follows: buying behaviour (BB) is a function of the individual characteristics (I) of the buying centre members, of the specific characteristics of the buying centre, or of the group (G) in charge of the purchase process, of the organisational (O) and environmental (E) characteristics.

Webster and Wind magnify the influence of the environmental factors, which may be related to other companies or technological, political, economic, sociological and cultural conditions. However, the authors do not indicate the exact nature and effect of these environmental influences.

The organisational characteristics related to the buying process consist of the policies, procedures, decision rules and criteria

which orientate the choices between possible products and suppliers.

The interpersonal characteristics refer to the relationships within the buying centre, where each individual aims at imposing his own system of needs, objectives and attitudes. The individual actor stands at the centre of Webster and Wind's model. Basically, his very preferences and attitudes are seen as crucial for the outcome of the decision process.

This model is fundamentally a descriptive one, essentially aimed at improving the analysis of industrial buying behaviour. However, one may regret that the model does not relate the suppliers' commercial strategies to the buying behaviour (outcome of the process).

2.2.1.3. Sheth's Model

Sheth's model is both original and unifying.[92] It is not content with putting forward a taxonomy as Buygrid does, but displays the whole set of the elements which may influence buying behaviour, including their inter-relationships. Moreover, this model is different from Howard and Sheth's previous one inasmuch as it consists of fewer and specific variables.

Buying behaviour is factored into three main elements. The first refers to the buying centre, the psychological universe and the expectations of the decision-makers; the second concentrates on the influence of the purchase situation, while the third focuses on collective decision-making features.

The members of the buying centre have different expectations, which result from their education, way of life and the role they are assigned.

The second part of the model deals with the influence of the purchase situation on the buying process, and with collective or

individual features of the decision. As regards the factors inherent in the product, the level of perceived risk, the novelty or importance of the purchase tend to foster collective decision-making, while pressing circumstances would generally lead to individual decision-making.

The third part of the model is devoted to analysing the collective decision-making process, and four methods for conflict resolution are identified.

Sheth's model points out the essential factors of industrial buying behaviour:

(i) the decision process,

(ii) the buying centre,

(iii) the influence of individual characteristics,

(iv) the influence of organisational characteristics, and

(v) the collective aspect of the decision-making process.

Furthermore, the model takes into consideration the various sources of information, be it within the addressing system's control or conveyed through word of mouth communication. However, the model supposes a level of rationality of the decision which may be questioned in the light of the organisational literature. This point is developed in Chapter V.

2.2.1.4. Hillier's Model

Hillier identifies three main processes in industrial buying.[93] The first one refers to the individual commitment to the buying process; the second one is related to the relationships between buyers and sellers; and the third one is the internal process which takes place within the purchasing organisation.

As regards the purchase process itself, Hillier was able to show

that its length is a function of three parameters: the complexity of the products being purchased, the complexity of the commercial procedures involved, and the complexity of the interactions between the participants in the purchase decision.

Hillier's distinction between three phases within the process may prove a useful tool for marketers. The first phase is seen as a negative stage, since the decision cannot be made until another decision is made, which enables the decision-making process to develop. Once the enabling decision is made, the decision-making process is at the starting point (zero-point). Other decisions will be made during the later phases, which compound the positive stage. The appeal of this analogy is divisable as follows:

(i) It acknowledges that decision-making in industrial buying situations consists of a sequence of incremental decisions rather than a single and global decision;

(ii) It shows that potential suppliers should concentrate their selling efforts on the individuals involved in the negative stage and zero point;

(iii) The relationship which is drawn between the nature of the purchase, the size of the buying centre and the length of the buying process furnishes useful indications of the time-limit within which would-be suppliers can submit their proposals.

Accordingly, Hillier's model is an important move towards operational models. However, it must be pointed out that this breakthrough is made at the expense of comprehensiveness, since very few variables are identified and characterised as to their influence on the decision.

2.2.1.5. Ozanne and Churchill's Model

As already pointed out, the models of the diffusion of innovation were first designed within spheres other than those of industrial products, before being adapted to the field of industrial marketing. In this respect, the most prominent works are those of Rogers within the scope of rural sociology,[94] which were adapted to industrial marketing by Ozanne and Churchill.[92]

Because of this specificity, Ozanne and Churchill's model may be studied and analysed along with models concentrating on industrial marketing. The model identifies five types of factors within the process of adoption of industrial products:

(i) the factors which originate the adoption process,

(ii) these which condition the final decision,

(iii) the length of the process,

(iv) the alternative solutions which are evoked,

(v) the role of the sources of information.

Although the empirical findings gathered by these researchers are not very significant, the conclusions that can be derived from them support other works and are consistent with intuitive analysis. Large organisations with a high proportion of technical or scientific human resources are said to adopt technological innovations in order to satisfy needs created by new products or processes. Small organisations' needs for innovations are more often caused by problems related to labour skills.

As regards the factors which condition the final decision, economic factors seem to prevail in large technological organisations, while past experience with suppliers seems more important for buying centres consisting of senior executives. Moreover, the empirical findings have proved the positive

correlation between the size of the buying centre and the length of the process to be significant. In this respect, the number of alternative solutions considered and the variety of information sources seem to be positively correlated with the buying centre members' level of education and broad-mindedness.

Ozanne and Churchill's descriptive model sheds an interesting light on the adoption process of industrial products. In particular, it is more explicit than the previous models about the influence of would-be suppliers' communications upon the process and the final decision. Martilla provides an empirical basis for the hypothesis that personal information plays an increasing role over the adoption process (i.e., the closer to the decision, the more important is personal information).[96] Table 5 indicates the importance of personal communication throughout the adoption process.

Table 5- Utilisation of information sources according to adoption process phases (From Martilla, note 96, p.175.) (Chi-square test 0.001-significant)

Consulted sources	Number and frequency of utilisations		
	Initiation	Evaluation	Control
Personal sources	334 (51%)	349 (70%)	289 (74%)
Impersonal sources	318 (49%)	151 (30%)	103 (26%)
Total	652 (100%)	500 (100%)	392 (100%)

Accordingly, early innovators have a powerful influence on the decisions to be made in other companies. The high proportion of innovating companies which have been consulted by other companies contemplating similar innovations have been pointed out by Czepiel.[97]

The search for information by companies plays an important part when defining the strategies aimed at adopting new industrial products. Researches concerned with modelling the adoption of

innovation, although shedding some light on the process of industrial buying, have not already put forward very significant empirical findings, in terms of scientific validity. Their external validity is generally confined to the products under consideration within the sample of reference, while their internal validity is bounded by observation and measurement difficulties.[98]

2.2.1.6. Choffray and Lilien's Model

Choffray's early works suggested that differences exist among the choice criteria used by the various categories of participants in the buying decision.[99] These differences are the basis of Choffray and Lilien's model of buying behaviour and adoption of industrial products. This model first appeared in 1978,[100] before giving rise to a more elaborate approach to market research and market assessment strategy.[101] Actually, these researchers have developed a model of response to industrial marketing strategies and an associated measurement methodology. The model draws upon state-of-the art knowledge of organisational buying behaviour and the theory of diffusion of innovation. It treats issues of determining the size of industrial product markets and addresses the problem of segmentation procedures. The processes of organisations' gaining awareness of, and setting purchase requirements for, new products are considered. In addition, model elements deal with differences in the decision-makers' product perceptions and preferences, group decision formation, and the rate of sales growth of a new product from its introduction to its ultimate potential.

Basically, Choffray and Lilien's model focuses on the links between the characteristics of an organisation's buying centre and three major stages in the industrial purchasing decision process through:

(i) Elimination of evoked product alternatives that do not meet organisational requirements;

(ii) Formation of decision participants' preferences;

(iii) Formation of organisational preferences.

Actually, few empirical studies have dealt with preference formation in industrial markets. Lehman and O'Shaughnessy have reported significant differences in the relative importance of several evaluation criteria, both among industrial buyers and across categories of products purchased.[102] Cardozo and Cagley have analysed procurement managers' preferences for specific bids and bidders that involve different level of risks.[103] Hakanson and Wootz investigated a similar problem, but in an international environment.[104] These studies noted the importance of perceived risk in individual buying behaviour. Scott and Bennet studied linear attitude models used to account for engineers' preferences for different brands of transistors.[105] Wildt and Bruno used a linear model to predict rank ordered preferences for capital equipment.[106] Choffray and Lilien developed models of individual preference formation and assessed the importance of differences in evaluation criteria across decision groups in the formation of individual preferences.[107]

Obviously, the problem of preference formation must not be overlooked in the present research, since preference models may be seen as resulting from the actors' rationalities. Accordingly, the present research is conceptually upstream to that of Choffray and Lilien. A traditional distinction exists between compensatory and non-compensatory models of individual preference:

(i) Compensatory models allow trade-offs between attributes (i.e., a low price can compensate for a short time of warranty);

(ii) Non-compensatory models do not admit such trade-offs. The

three types of non-compensatory models are:

(a) Dominance models: these assume that when comparing alternatives, individuals identify the subset of them that dominate all others on all evaluation criteria simultaneously;

(b) Conjunctive-disjunctive models: conjunctive models assert that a product to be considered for final choice has to meet minimum requirements on all evaluation criteria simultaneously. Disjunctive models evaluate product alternatives on the basis of their maximum level on some criteria. To be considered for choice, a product has then to exceed the requirement on some, and not all, evaluation criteria;

(c) Lexicographic models: these processes attribute levels sequentially. First, product alternatives are ranked in accordance with the most important evaluation criterion. If all of them can be ranked alongside this criterion, the remaining evaluation criteria are not considered.[108]

The differences in choice criteria and models of preference formation were used by Choffray and Lilien as bases for segmentation procedures. The problem of segmentation is addressed in 2.3.

2.2.1.7. Baker´s Model

Modelling buyer behaviour has long been at the centre of Baker´s works. Baker´s model has been subject to various modifications since it appeared in 1976.[109] The current version of the model may be stated notationally as:[110]

P= f [SP,(PC,EC,(Ta-Td),(Ea-Ed),BR)], where
P= purchase
f= an unspecified function of
SP= selective perception

PC= precipitating circumstances
EC= enabling conditions
Ta= technological advantages
Td= technological disadvantages
Ea= economic advantages
Ed= economic disadvantages
BR= behavioural response

PC is equivalent to "awareness", EC to "interest", (Ta-Td) and (Ea-Ed) represent "evaluation", and BR dictates the action taken. Baker acknowledges that the precise nature of the function is not known and points out the unlikelihood of formalising such an elusive interaction between the variables of the model.[111] Enabling conditions (EC) embraces all those factors which make it possible for a prospective purchaser to benefit from the new product. According to Baker, the existence of EC will define "all those individuals or organisations which conceivably have a use for [the] new product."[112] However, EC is a necessary but not sufficient condition for defining the potential market for a product. A more selective focus is provided by the identification of precipitating circumstances (PC) which would have the effect of "converting an essentially latent primary demand into an active recognition of the possible means of satisfying a felt need."[113]

Although the fundamental structure of Baker's sequential process model has remained relatively unchanged over time, a recent modification has made it much more powerful. This modification is the introduction of the selective perception variable (SP) into the model. By placing SP at the beginning as a factor mediating the other variables, it is aimed at communicating that awareness of a purchase opportunity (EC), the information selected for evaluation and the interpretation placed upon it (i.e., (Ta-Td) and (Ea-Ed)) are relative and subjective processes. This seems to represent a move from Baker's early emphasis on the buyer's economic rationality.[114] In fact, the introduction of SP in the model allows both a sharper analysis of buying behaviour and a greater

distinction between the rationalities which deal with the purchase problem. Actually, it is the mediation of such a selective variable which is lacking in the models reviewed above. Even in Choffray and Lilien's model, the sophisticated basis of segmentation (which integrates models of preference formation, models of individual choice, model of collective choice, etc.) fails to consider that awareness may be subject to subjective variations according to variables which must be identified by the researcher. It is this research's suggestion that two of these mediating variables (influencing selective perception) are the decision-makers' rationalities and strategies, which are considered as components of organisational climate.

Besides the explicit reference to selective perception, Baker's model is of a double interest: it is both flexible and general. On the one hand, like that of Choffay and Lilien, Baker's model applies equally to the purchase of a product of which the user has no prior experience (innovation) and to the purchase of known products (in which case some phases of the model may be omitted). On the other hand, the model's structure enables it to be applied either to individual or to organisational buying situations. According to Baker, the distinction between a "qualitative/ behavioural nature" of the former and the "quantitative/ rational/economic nature" of the latter is largely spurious: "all buying decisions are subject to the same economic and behavioural influences and in the majority of cases follow the same process."[115]

Naturally, the price for the model's generality and flexibility is its lack of specificity. However, the model may be made specific and operational if the interested marketers introduce into it the particular parameters of the problem they are concerned with. In fact, the model achieves a powerful compromise between over-specificity, which would render it impractical, and over-generality,

which would confine it to triviality.

2.2.2. Evaluation of Integrated Conceptual Models

Robinson and Faris' pioneer model lacks comprehensivity but, at least, is interesting in terms of simplicity. Webster and Wind's model and Sheth's model are both general and very complete.

The main advantages and deficiencies of Webster and Wind's model stem from its general character. The model provides marketers both with a good synthesis and an analytical scheme which deals with industrial buying behaviour key variables and their interactions. But it does not always offer sufficient information about the influences of these variables.

Prior to Sheth's model, Webster and Wind's model has had, and still has, a good heuristic power, since it has attracted several researchers investigating various particular fields. Furthermore, the model may be used as an integrative reference by those trying to gain general insights into industrial buying behaviour.

As for Sheth's model, it does not take into sufficient consideration the situational and contextual variables which influence both the process and the purchase decision.

Hillier's model innovates by conceptualising the internal process phases, and is more operational than the previous models since it takes into consideration the supplier-customer relationship, as well as the suppliers' marketing strategies. However, Hillier's model is less comprehensive than those of Sheth and Webster and Wind.

Ozanne and Churchill's model was developed in order to characterise the process of adoption of new industrial products. Owing to this specific character, the model presents a sequence of cognitive, affective and conative phases. However, although the

model points out the influences of stimuli on each phase, it does not identify the various purchase situations taken into consideration by the other models.

Choffray and Lilien's model is interesting inasmuch as it is one of the first operational approaches to industrial buying behaviour: it deals with the individual preferences of the buying centre's members, and addresses the issue of integrating these individual preferences into collective decisions. In this respect, it is worthwhile noticing that the present research differs from that of Choffray and Lilien inasmuch as it is herein suggested that these preferences are not to be understood in techno-economic terms only.

Choffray and Lilien's model can be applied to new industrial products and develops a methodology for assessing and analysing industrial buyers' preferences and utilising these data in terms of marketing strategy. While the previous global models are essentially qualitative and descriptive, Choffray and Lilien's one lends itself to quantification.

To be sure, Baker's model does not lend itself to quantification. Rather, it aims at providing a conceptual framework for marketers. The advantages of this framework are the following: (i) the introduction of the mediating selective perception variable enables a new kind of segmentation to be performed (based, for example, on the decision-makers' rationalities and strategies); (ii) the model applies to innovation; (iii) the model refutes the traditional and increasingly challenged dichotomy between consumption rationality and industrial buying rationality. Fig.21 provides a synoptic evaluation of the aforementioned models.[116]

Fig.21- Synoptic evaluation of global models

Models / Criteria	R.& B.	W.& W.	S.	H.	O.& C.	C.& L.	B.
Formal criteria							
Quality of formulation	4	4	6	4	4	6	3
Internal consistency	6	5	5	4	4	5	5
Strength	0	4	4	6	6	2	6
Semantic criteria							
Accuracy of vocabulary	3	3	3	3	3	4	3
Conceptual unity	4	4	3	2	4	4	4
Empirical interpretability	4	3	4	4	2	5	4
Representativity	1	4	4	3	4	3	5
Methodological criteria							
Falsifiability	4	2	1	4	2	5	2
Methodological simplicity	4	3	1	4	2	4	4
Epistemological criteria							
Factual confirmation	6	NS	NS	4	2	4	4
Originality	2	4	4	4	4	4	6
External consistency	4	4	4	4	4	6	4
Unifying power	2	4	4	4	4	2	4
Heuristic power	1	6	3	6	4	2	5
Stability	2	2	2	2	2	4	6

["Meaning" of the grades: NS = not studied; 6 = very good; 5 = good to very good; 4 = good; 3 = fair to good; 2 = fair; 1 = poor to fair; 0 = poor]

Criteria for analysing the models:

(i) Formal criteria
- (a) Quality of formulation: the theory is consistent with elementary logic rules;
- (b) Internal consistency: the theory does not contain any contradiction of logic;
- (c) Strength: the theory enables other theories to be derived;

(ii) Semantic criteria
- (a) Accuracy of vocabulary: the theory does not use ambiguous or fuzzy notions;
- (b) Conceptual unity: the theory components refer to the same set of behavioural phenomena;
- (c) Empirical interpretability: the theory may be operationalised, it can give rise to experimentation;
- (d) Representativity: the theory deals with fundamental processes;

(iii) Methodological criteria
- (a) Falsifiability: the theory is amenable to tests;
- (b) Methodological simplicity: the theory is easy to construct and test;

(iv) Epistemological criteria
(a) Factual confirmation: the theory may be empirically corroborated;
(b) Originality: the theory improves knowledge by deriving new propositions;
(c) External consistency: the theory is consistent with existing knowledge;
(d) Unifying power: the theory connects concepts which were not already connected;
(e) Heuristic power: the theory suggests new fields for research;
(f) Stability: the theory is not "upset" by new evidences.

Analysing buying behaviour, both at the organisational and the individual level, is not a gratuitous activity. Such a study is aimed at directing further marketing strategies. One of these is segmentation.

2.3. Segmentation

As a theory, market segmentation is concerned with grouping potential customers into sets which are homogeneous in response to some elements of the marketing mix. The point being that this homogeneity of response allows refinements in the development of marketing strategy. This raises the problem of the basis on which the segmentation will be realised. According to Choffray and Lilien,[117]

> "A segmentation basis is a criterion according to which potential customers are grouped. The choice of this criterion is critical. An optimum segmentation basis is one that minimises the ratio of within segment variance to across segment variance for the response or behavioural variable of interest."

A segment descriptor is a variable or characteristic which is (i) linked to segment membership, and (ii) relevant for marketing strategy formulation.[118] The choice of this descriptor is crucial in terms of marketing strategy, and the present research concentrates on the importance of segmentation for selling tactics.

2.3.1 Strategies and Requirements

Once markets have been segmented, companies can elect to follow any of three strategies:

(i) Undifferentiated marketing, i.e., one product is presented to the market and it is supported with the same mix of promotional activities in all segments;

(ii) Concentrated marketing, i.e., the company aims at a single market segment with considerable potential and develops a product and communication mix adapted to the needs of this segment;

(iii) Differentiated marketing, i.e., the firm develops a mix of products and communication strategies which aim at different segments of the market.

Three conditions must be met by any segmentation strategy. The first one is homogeneity, a measure of the degree to which potential customers in a segment are similar in terms of some response variable of interest. The second condition is parsimony, i.e., the degree to which the segments are large enough to be worth considering. The third condition is accessibility, the degree to which one is able to characterise segments by observable descriptor variables in order to develop differentiated marketing strategies.[119]

2.3.2. Previous Studies

Wind's 1974 review of the literature provides comprehensive information about the contemporary status and advances in segmentation research.[120] However, as indicated in Sheth's review of the literature on organisational buying behaviour, market

segmentation theory is not applied at anywhere near the level it has been used in consumer behaviour studies.[121] According to Wind and Cardozo, segmentation analysis is usually carried out ex post facto in industrial markets: to assess products' past performance rather than to design actual marketing strategies.[122] Wind and Cardozo's report that relevant segmentation methodology is lacking for industrial markets was one of the reason for Choffray and Lilien's own attempts to design an effective industrial segmentation strategy.[123]

2.3.3. Segmentation Approaches

The approach advocated here is a twofold one. The first step, macro-segmentation, defines the target market and characterises the firms that are likely to react to a product differently because of their industry, geographic location, or other readily observable characteristics. This first stage may be related to the identification of "enabling conditions", as Baker has it, although EC may refer to characteristics less obvious than geography or industry.[124] According to Choffray and Lilien, most data needed for this screening is drawn from secondary sources.[125]

Second, macro-segments retained as targets may be further divided into micro-segments on the basis of various characteristics. Baker's concept of "precipitating circumstances" could be used for this purpose. Choffray and Lilien have based their micro-segmentation strategy on similarities between decision-making units, and concentrated on the pattern of involvement in the buying decision process. Their segmentation procedure uses a decision matrix to measure each firm's decision process. Basically, the key questions are the following:[126]

(i) How do the micro-segments differ in the pattern of involvement in the purchasing process?

(ii) How does membership in a particular micro-segment relate to other characteristics of the organisation?

To answer these questions and identify the extent to which the identification of micro-segments can aid in marketing, Choffray and Lilien resort to a highly structured approach. This approach concentrates on formal characteristics. The present research aims at determining the extent to which less formal characteristics, such as the organisational actors' rationalities and strategies (which are to be related to corporate idiosyncracies and organisational climate) do influence the decision process. To do so, this research will focus on "selective perception", rather than on "enabling conditions" or "precipitating circumstances" per se, in Baker's terminology.

3. Conclusion of the Fourth Chapter

This chapter has successively analysed, in Sections 1 and 2, the symmetrical processes of innovation - generation and adoption - respectively in addressing and addressed systems. In both cases, the normative theory has been discussed, and alternative viewpoints were suggested where appropriate; these suggestions are studied in more detail in Chapters VII and VIII.

The problem of adoption was addressed both at collective and individual levels, since these two aspects are to be considered in organisational decision-making. The consequence of this duality of the conceptual level within the organisation is the necessity for a twofold level of segmentation: macro-segmentation, which concentrates on the firms, and micro-segmentation, which

concentrates on the decision-making unit.

The present research studies the interface between corporate idiosyncracies (inasmuch as they determine the organisation's climate) and the acceptance of technological innovations. Accordingly, attention must now be focused on two questions: (i) that of the nature of the interface, and (ii) that of the methodology to characterise the interface and determine its influence on the purchase decision. These two questions are respectively treated in Chapters V and VI.

CHAPTER IV

NOTES AND REFERENCES

1- Baker, M.J. Market development. Harmondsworth, Penguin Books, Ltd, 1983.

2- Ibid, p.20.

3- Ibid.

4- Morton, J.A. Organising for innovation. New York, 1971, p.171.

5- Gregory, S.A. (Editor). Creativity and innovation in engineering. London, Butterworths, 1972, pp.59-71.

6- Miller, D.W., & M.K. Starr. Executive decisions and operations research. Englewood Cliffs, N.J., Prentice-Hall, 1960.

7- Drevdahl, J.E. Factors of importance for creativity. Journal of Clinical Psychology, vol.12 (21), 1956.

8- Haefele, J.W. Creativity and innovation. New York, Reinhold, 1962.

9- Gulas, S. Possibilities of taking advantage of psychotronics in creative activity with substituting the factor of casualness by the factor of information. Paper presented at the first International Conference on Psychotronics and Parapsychological Research. Prague, 19 June 1973. p.7.

10- Holt, K. Product innovation. London, Newness-Butterworths, 1977. p.21.

11- Ibid., p.22.

12- See: Ibid, p.24.

13- Baker, M.J. Market development. Op.cit., p.20.

14- Ibid., p.21.

15- Zwicky, F. The morphological method of analysis and construction, in Studies and essays. New york, Interscience, 1948.

16- Watts, R.D. The elements of design. In The design method. London, Butterworths, 1966.

17- Jantsch, E. Technological forecasting in perspective. Paris, OECD,1967.

18- Nicholson, R.L.R. Technological forecasting as a management technique. HMSO, 1968.

19- Bridgewater, A.V. Morphological methods: principle and practice. In Technological forecasting, edited by R.V. Arnfield. Edinburgh University Press, 1969.

20- Twiss, B.C. Managing technological innovation. Op.cit., p.79.

21- Ibid.

22- Ibid., p.230.

23- Bright, J.R. Evaluating signals of technological change. Harvard Business Review, January-February 1970.

24- Twiss, B.C. Op.cit., p.80.

25- Holt, K. Op.cit., p.83.

26- See: Gregory, S.A. Op.cit., pp.-189-190.

27- See: Twiss, B.C. Op.cit., p.84.

28- Rickards, T. Brainstorming in an R & D environment. R & D Management, vol.3, June 1973.

29- Gordon started his research into the creative process in 1944 at Harvard University. He designed his technique when working in the Invention Design Group of Arthur D. Little Inc., before forming Synectics Inc., when he refined the operational methodology of synectics. See:
- Gordon, W.J.J. Synectics: the development of creative capacity. New York, Harper, 1961.

30- Holt, K. Op.cit., p.86.

31- Gregory, S.A. Op.cit., pp.190-191.

32- See: Prince, G.M. The practice of creativity: a manual for group problem solving. New York, Harper and Row, 1970.

33- See: Bono, E., de. Lateral thinking for management. London, McGraw-Hill,. 1971, p.4.

34- Ibid., p.17.

35- Ibid., p.52.

36- Baker, M.J. Market development. Op.cit., p.28.

37- See: Ibid.

38- Ibid.

39- Ibid., p.29.

40- Ibid., p.30.

41- See: Ibid.

42- Baker, M.J. Marketing new industrial products. London, Macmillan, 1975, pp.15-16.

43- Baker, M.J. Market development. Op.cit., p.49.

44- Briscoe, G. Some observations on new industrial product failures. Industrial Marketing Management, vol.2, February 1973,

pp.151-162.

45- Baker, M.J. Market development. Op.cit.

46- See:

- Cooper, R.G. Why new industrial products fail. Industrial Marketing Management, December 1975, pp.315-326.

- Cooper,R.G. Project New-Prod. McGill University, 1979.

47- Calantone, R.J., & R.G. Cooper. A typology of industrial new product failures. In 1977 Educator's Conference Proceedings, edited by Greenberg & Bellenger. Chicago, AMA, 1977, pp.492-497.

48- Hopkins, D.S., & E.L. Bailey. New-product pressures. The Conference Board Record, vol.7 (6), June 1971.

49- Hippel, E.A., von. Successful industrial products from customer ideas. Journal of Marketing, vol.42 (1), January 1978, pp.39-49.

50- Rothwell, R., C. Freeman, A. Horsley, V.T.P. Jervis, A.B. Robertson, & J. Townsend. Sappho updated - Project Sappho phase II. Research Policy, vol.3, 1974, pp.258-291.

51- Mansfield, E., & S. Wagner. Organisational and strategic factors associated with probabilities of success in industrial R & D. Journal of Business, vol.48, April 1975, pp.178-198.

52- Ibid.

53- Booz, Allen & Hamilton. Management of new products, 1965.

54- Mansfield, E., & S. Wagner. Op.cit.

55- Cooper, R.G. Why new product fail. Op.cit.

56- Calentone, R.J., & R.G. Cooper. A typology of industrial new product failures. Op.cit.

57- Hippel, E.A., von. Successful industrial products from customer ideas. Op.cit.

58- Meadows, D. Estimate accuracy and project selection models in industrial research. Industrial Management Review, Spring 1969. Also: Meadows, D. Data Appendix: accuracy of technical estimates in industrial research planning. MIT, Sloan School of Management, Working paper No.301-67, 1967.

59- Peplow, M.E. Design acceptance. In The design method, edited by S.A. Gregory. London, Butterworths, 1960.

60- Hippel, E.A., von. Transferring process equipment innovations from user-innovators to equipment manufacturing firms. R & D Management, October 1977.

61- Berger, A. Factors influencing the locus of innovation activity leading to scientific instrument and plastic innovations. SM thesis, MIT, Sloan School of Management, June 1975.

62- Boyden, J. A study of the innovation process in the plastics

additives industry. SM thesis, MIT, Sloan School of Management, January 1976.

63- Utterback, J. The process of innovation: a study of the origination and development of ideas for scientific instruments. IEEE Transactions on Engineering Management, November 1971.

64- Robinson, P., & C.W. Faris. Industrial buying and creative marketing. Boston, Allyn and Bacon, 1967.

65- Isenson, R. Project Insight: an empirical study of the sources of ideas utilised in operational weapon systems. In Factors in the transfer of technology, edited by W. Gruber & D. Marquis. Cambridge, Mass., MIT Press, 1969, p.157.

66- Materials Advisory Board, Division of Engineering, National Research Council. Report on the Ad Hoc Committee on Principles of Research-Engineering Interaction. Publication MAB-222-M. Washington, D.C., National Academy of Sciences-National Research Council, July 1966, pp.15-16.

67- See, for examples:

- Litwak, E., & L.F. Hylton. Interorganisational analysis: a hypothesis on coordinating agencies. Administrative Science Quarterly, vol.6 (4),1962, pp.395-420.

- Marret, C.B. On the specification of interorganisation dimensions. Sociology and Social Research, vol.61, 1972, pp.83-99.

- Reve, T., & L.W. Stern. Interorganisation relations in marketing channels. Academy of Management Review, vol.4 (3), 1979, pp.405-416.

68- Williamson, O.E. Markets and hierarchies: analysis and antitrust implications. New York, The Free Press, 1975.

69- From: Hakanson, H. (Editor) International marketing and purchasing of industrial goods - An interaction approach. New York, Wiley, 1982, p.14.

70- See: Baker, M.J. Market development. Op.cit., p.30.

71- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. New York, John Wiley and Sons, 1980, p.37.

72- Ibid., p.34.

73- Nabseth, L., & G.F. Ray. Op.cit., p. 7.

74- Zaltman, G., R. Duncan, & J. Holbeck. Innovations and Organisations. Op.cit., p.62.

75- Milo, N. Health care organisations and innovations. Journal of Health and Social Behaviour, vol.12, 1971, pp.163-173.

76- Shepard, H.A. Innovation-resisting and Innovation-producing organisations. Journal of Business, vol.40 (4), 1967, pp.470-477, p.470.

77- Hage, J., & Aiken, M. Social change in complex organisations. New York, Random House, 1970, p.113.

78- Wilson, 1966. (quoted in Zaltman et al. Op.cit)

79- Zaltman, G., et al. Innovations and organisations. Op.cit., p.62.

80- Lin, N., & G. Zaltman. Dimensions of innovations. In Processes and phenomena of social change, edited by G. Zaltman. New York, Wiley-Interscience Publication, 1971, pp.656-657.

81- Zaltman, G., et al. Innovations and organisations. Op.cit., pp.60-62.

82- March, J.G., & J.P. Olsen. Organisational choice under ambiguity. In Ambiguity and choice in organisations. Op.cit., pp.10-23, p.18.

83- Zaltman, G., et al. Innovations and organisations. Op.cit., p.62.

84- Rogers, E.M., & F.F. Shoemaker. Communication of innovations: a cross cultural approach. New York, The Free Press, 1971, p.106.

85- Cohen, M.D., J.G. March, & J.P. Olsen. People, problems, solutions and the ambiguity of relevance. In Ambiguity and choice in organisations. Op.cit., pp.24-37, p.26.

86- Zaltman, G., et al. Innovations and organisations. Op.cit., p.66.

87- References of researches may be found in:

- Webster, F.R., Jr. Industrial marketing strategy. New York, John Wiley and Sons, 1979.

- Cox, W.E., Jr. Industrial marketing research. New York, John Wiley and Sons, 1979.

88- For a recent review of the most important models of consumer behaviour, see:
- Foxall, G. Marketing models of buyer behaviour: a critical review. European Research, September 1980, pp.195-206.

89- Robinson, P.J., & C.W. Faris. Industrial buying and creative marketing. Boston, Allyn and Bacon, 1967.

90- Further extension has been given to the model, in order to render it more comprehensive. See:
- Hill, R.W. The nature of industrial buying decisions. Industrial Marketing Management, vol.2 (1), 1972, pp.45-55.

91- Webster, F.E., Jr., & Y. Wind. A general model for understanding organisational buying behaviour. Journal of Marketing, vol.36, April 1972, pp.12-19.

92- See: Sheth, J.N. Presentation d'un model de comportement des acheteurs industriels. Encyclopedie du Marketing, vol.1, 1976, pp.1-8.

93- See:
- Hillier, T.J. Decision-making in the industrial buying process. Ph.D. thesis, The Management Center, University of Bradford, 1972.

- Hillier, T.J. Decision-making in the corporate industrial buying process. Industrial Marketing Management, June 1975, pp.99-106.

94- Rogers, E.M. Diffusion of innovations. New York, The Free Press, 1962.

95- Ozanne, U.B., & G.A. Churchill, Jr. Five dimensions of the industrial adoption process. Journal of Marketing Research, vol.8, 1971, pp.322-328.

96- Martilla, J.A. Word of mouth communication in the industrial adoption process. Journal or Marketing Research, vol.8, 1971, pp.173-178.

97- Czepiel, J.A. Word of mouth processes in the diffusion of a major technological innovation. Journal of Marketing Research, vol.11, 1974, pp.172-180.

98- See: Pras, B., & J.-Cl. Tarondeau. Comportement de l'acheteur. Paris, Editions Sirey, 1981, p.250.

99- Choffray, J.-M. A methodology for investigating the structure of the industrial adoption process and the differences in perception and evaluation criteria among potential decision participants. Ph.D. thesis, MIT, Sloan School of Management, April 1977.

100- Choffray, J.-M., & G.L. Lilien. Assessing response to industrial marketing strategy. Journal of Marketing, vol.42, 1978, pp.20-31.

101- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. New York, John Wiley and Sons, 1980.

102-Lehman, D.R., & J. O'Shaugnessy. Differences in attitude importance for different industrial products. Journal of Marketing, vol.38, April 1974, pp.36-42.

103- Cardozo, R.N., & J.W. Cagley. An experimental study of industrial buyer behaviour. Journal of Marketing Research, vol.8, August 1971, pp.329-334.

104- Hakanson, H., & B. Wootz. Supplier selection in an industrial environment - An experimental study. Journal of Marketing Research, vol.12, February 1975, pp.46-51.

105- Scott, J.E., & P.D. Bennet. Cognitive models of attitude structure: "value importance" is important. In Relevance in marketing: problems, research, action, edited by F.C. Allvine. Chicago, AMA, 1971.

106- Wildt, A.R., & A.V. Bruno. The prediction of preference for capital equipment using linear attitude models. Journal of Marketing Research, vol.11, May 1974, pp.203-205.

107- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. Op.cit.

108- From: Choffray, J.-M., & G.L. Lilien. Ibid., pp.127-128.

109- Baker, M.J. (Editor) Marketing: theory and practice. London, Macmillan, 1976, pp.128-131.

110- See: Baker, M.J. Market development. Op.cit., p.61.

111- Ibid.

112- Ibid., p.65.

113- Ibid.

114- See: Baker, M.J. Marketing: an introductory text. Op.cit., p.100.

115- Ibid., p.99.

116- This evaluation draws on:
- Pras, B., & J.-Cl. Tarondeau. Comportement de l'acheteur. Op.cit., p.252.

The evaluation criteria are borrowed from:
-Bunge, M. Scientific research. Berlin, Springer, vol.I & II, 1967.

117- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. Op.cit., p.78.

118- See: Ibid.

119- See: Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. Op.cit., p.79.

120- Wind, Y. Issues and advances in segmentation research. Journal of Marketing Research, vol.15 (3), 1974, pp.318-337.

121- Sheth, J.N. Recent developments in organisational buying behaviour. University of Illinois, College of Commerce and Business Administration. Working paper No.317, August 1976.

122- Wind, Y., & R. Cardozo. Industrial market segmentation. Industrial Marketing Management, vol.3, 1974, pp.153-166.

123- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. Op.cit., p.81.

124- Baker, M.J. Market development. Op.cit., pp.61-62.

125- Choffray, J.-M., & G.L. Lilien. Market analysis for new industrial products. Op.cit., p.81.

126- Ibid., pp.81-85.

CHAPTER V

THE INTERFACE : DECISION-MAKING, RATIONALITIES AND STRATEGIES

0. Introduction

The two hemispheres of the problem have already been introduced: corporate idiosyncracies, inasmuch as they determine the organisation's climate (Chapter III), and new technologies considered under the aspect of their adoption (Chapter IV). Consequently, this chapter is devoted to studying the so far problematic interface between these two aspects of organisational life. The postulate of this research being that two of the dimensions of organisational climate are the rationalities and strategies implemented by the organisational actors, this interface will, naturally, be worked out within the scope of these two concepts.

Briefly, this chapter aims at reviewing the various models of rationality, as they give rise to particular strategies, proposed in the literature. For purposes of clarity, these two concepts will be first considered at the individual level (Section 2) and then at the collective level (Section 3). However, rationality and strategy are rarely explicit as to their nature. It is only through the decisions they give rise to that they may be studied. Accordingly, the first section of the chapter is devoted to analysing the concept of decision.

CHAPTER V

SECTION 1 THE CONCEPT OF DECISION

1.1. Decision-Making as an Action on a Substance

From the outset, it is important to distinguish "decision" from "decision-making". The former refers to the substantial content of the process (e.g., purchasing a new type of machine-tool, replacing the outdated computer, etc.), while the latter determines this substantial content (e.g., analysis of the alternative possibilities, comparison, etc.).

The decision-making process consists, therefore, of a series of actions on a substance composed of the elements of the decision. The process transforms these elements into a more or less detailed statement of what is going to be done.[1] These actions are of various types and most of the models examined below may be characterised by the type they concentrate on. The latter remark points out the difference between choices and decisions: a decision consists of a cumulative sequence of stages of choices.[2]

Another aspect of decision-making must not be overlooked: decision-making, at the individual level, is an intentional mental action which aims at modifying or deforming a state of things in order to attain a given objective. Consequently, two dimensions of decision must be considered, as the following lines indicate.

1.2. Actual Decision and Virtual Decision

The following lines are partly based on some lectures on decision support systems by J.-C. Courbon, professor at the University of Geneva.

Undoubtedly, the most manifest characteristic of a decision is that it concerns objects it aims to modify. However, any decision results from a representation (i.e., a model) which the decision-

maker has about the situation with which he is dealing. Therefore, any decision may be viewed as the result of an instrumental representation imagined by the decision-maker. This leads one to the second aspect of decision - what could be called the "true" decision - and which consists of the decision-maker's modifying, deforming (or possibly keeping unchanged) the representation he has about the situation he is facing. In other words, the concept of decision involves two aspects: an actual decision (action on things), and a virtual decision (action on representations). Of course, these two aspects are connected, and the following lines deal with this connection.

1.3. Observation/Measure and Operationalisation/Modelling

The actual decision, implying an action on objects, involves some expectations as to the state of environment likely to result from the decision. Schematically, the result may be of three types: (i) the objects have been modified in the expected way; or (ii) the objects have been modified in an unexpected way; or (iii) other objects than those the decision was concerned with have been modified.

At this stage, it is to be noticed that the control of the modification of these objects (e.g., labour-savings resulting from operating modernised plants, time-saving resulting from using word-processors, etc.) implies the possibility of resorting to an instrument of measure and that the decision-maker wants to use this instrument. This also implies a choice of what will be measured and assessed. The latter remark leads back to the representation of the situation, since the possible discrepancies observed after the actual decision will generate a new virtual decision. As a matter of fact, usually:

(i) An expected result will tend to strengthen the reliance on the present representation and, consequently, the virtual decision will consist in maintaining this representation;

(ii) An unexpected result on the relevant objects (i.e., those within the target) incites to modify the representation in order to improve the quality or accuracy of the present representation. The modification may be termed a convergent modification;

(iii) An impact on objects outside the target of the actual decision will suggest modification of the representation in order to widen or generalise it. Such a modification may be called a divergent modification.

The process fom observation to action on the representation, i.e., to virtual decision, may be compared to the "intelligence" phase of Simon's model.[3] At this stage, the decision-maker will try to infer a number of explanations of the observed differences, in order to modify his representation. This phase of invention does not always enable a new instrumental and operational representation to be obtained. Then, it is necessary to transform the representation into a model to be used for actual decisions: this phase may be paralleled to that of "conception" in Simon's model. In turn, this phase results in models and procedures, supports of the actual decision-making process which may be:

(i) Structured, lending themselves to programmation;

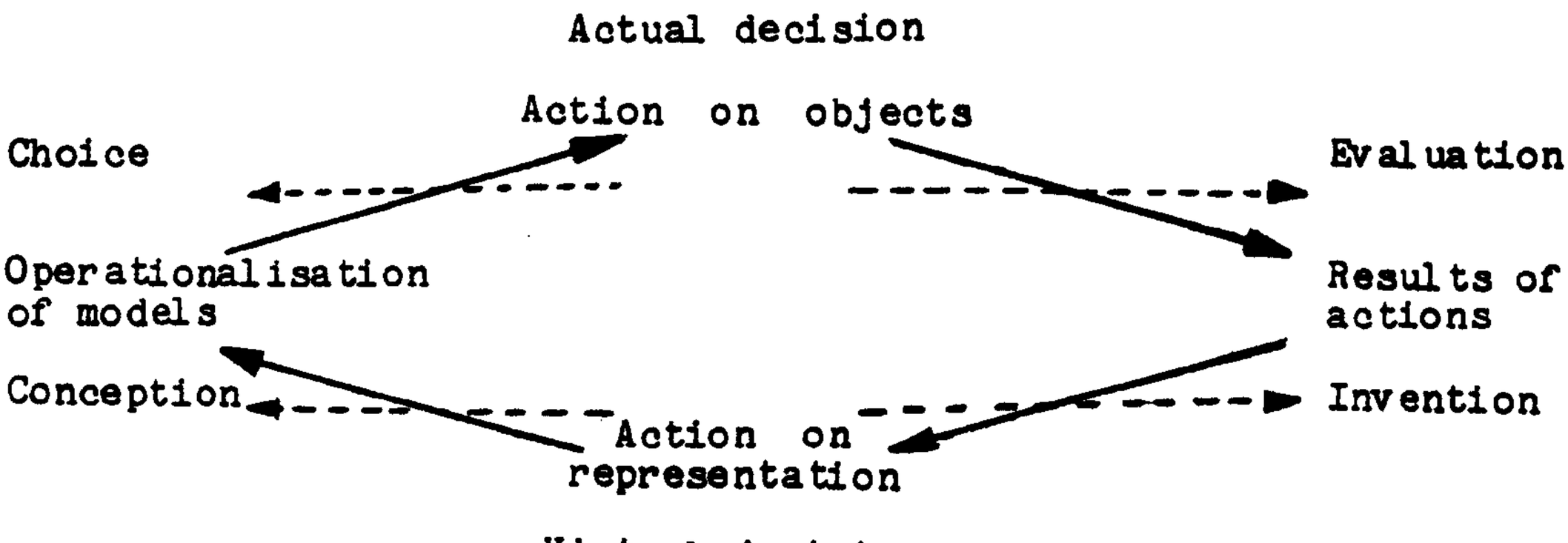
(ii) Weakly structured: these models are difficult to programme, more or less compatible, and leave room for judgment or intuition;

(iii) Unstructured: in this case, the representation is difficult to explain, does not lend itself to operationalisation, which does not prevent actual decisions to be made.

CHAPTER V

To conclude this analysis of the connection between actual decision and virtual decision, a fourth phase may be pointed out, that of choice, which leads one back to the real decision. The process then consists of exerting this action on the objects by choosing a mode of action on the basis of the available models. This analysis of both aspects of decision-making may be schematised as Fig.22 indicates (in a way similar to that of Kolb's learning model).[4]

Fig.22- Actual decision, virtual decision



The main advantage of this diagram is that of (i) pointing out the two aspects of decisions, namely actual decisions and virtual decisions; (ii) showing that the connection between these two aspects is equivalent to Simon's model of decision-making; (iii) illustrating the dialectic process which takes place as a result of two intentional processes, one of observation and assessment, the other of modelisation and operationalisation of the representations.

However, the rationale of this conception is challenged by March and Olsen's refutation of the complete cycle of choice.[5] According to these researchers, actions and events are ambiguous: "it is not clear what happened, or why it happened."[6] Actually, their argument is that ambiguity may be inherent in the events, or

be caused by the difficulties in observing them. The reason for this is, after March and Olsen, that the "complexity of, and change in, the environment often overpower our cognitive capacity."[7] In fact, March and Olsen criticise the conception of the decision-maker's rationality, i.e., the "model of individual and rational adaptation."[8] The problem of the decision-maker's rationality constitutes the core of the following section.

SECTION 2 THE PROBLEM OF INDIVIDUAL RATIONALITY AND STRATEGY

This section aims at assessing the main theories of individual rationality and strategy in order to orientate this research's fundamental purpose: that of connecting organisational actors' rationalities and strategies (as part of corporate idiosyncracies and organisational climate) to the decision related to a technological innovation (adoption, rejection, or deferred final decision). In this respect, it is worth noticing that strategy and rationality are interlinked inasmuch as explaining a given strategy is to make certain key-assumptions about the way means and ends were related by the decision- maker. However, it is generally assumed that analysts must look for rationality in the area of choice of means for fixed objectives rather than the objectives themselves.[9] Furthermore, rationality may stand (when the concept is used in a normative way) as a justification for the decisions involved in given strategies.[10] Various conceptions of rationality pervade the literature and several formulations could be put forward. Nevertheless, three main approaches to the paradigm of rationality may be distinguished according to the principle on which they ground their arguments:

(i) Rationality as a function of maximisation;

(ii) Rationality as a function of minimisation;

(iii) Rationality as a function of correlation.

These three viewpoints are examined in the following lines.

2.1. Rationality as a Function of Maximisation

2.1.1. The Weberian Actor

The study of rationality lies at the centre of Max Weber's work. To the extent that, according to Brubaker, on whose research this section draws substantially, Weber's seemingly disparate empirical studies converge on one underlying aim: to characterise and to explain the development of the "specific and peculiar rationalism" that distinguishes modern Western civilisation from every other.[11] However, Weber's notion of rationality is far from being unequivocal, and no fewer than sixteen apparent menings of "rational" can be culled from Weber's writings: deliberate, systematic, calculable, impersonal, instrumental, exact, quantitative, rule-governed, predictable, methodical, purposeful, sober, scrupulous, efficacious, intelligible and consistent.[12] But, as is too often neglected by organisation analysts, throughout his empirical works Weber uses "rational" in a non-evaluative sense. In fact, according to Weber, tne essence of modern capitalism is its rationality: market transactions are determined solely by the "purposeful pursuit of interests", and an "orientation to the commodity and only to that."[13] Then, according to Weber, the economic actor is characterised by a double rationality: his subjectively rational (purely instrumental) market transactions are guided by objectively rational (purely quantitative) calculations.

2.1.1.1. Technical and Economic Rationalities

Weber's most famous discussion of rational action occurs in the opening pages of Economy and society, where he sketches four ways in which action may be determined. Traditional action is determined by habits; affectual action, by strong feelings; value-oriented action, by a conscious belief in the intrinsic value of acting in a certain way, regardless of the consequences of so acting; and instrumental action, by a consciously calculating attempt to achieve desired ends with appropriate means. Underlying this four-fold typology is a more basic, though implicit, distinction between rational and non-rational action. Insofar as the individual is not the self-conscious and deliberate author of his action, in so far as he is carried along by habits (as in purely traditional action) or carried away by feelings (as in purely affectual action) - to this extent, his conduct is non-rational. Insofar as the individual acts deliberately and is consciously aware of what he is doing, on the other hand, his action is rational.

However, according to Weber, two other aspects of rationality must not be neglected: first, rationality does not innere in things, but is ascribed to them. Secondly, rationality is a relational concept: a behaviour can be rational (or irrational) only from a particular point of view, never in and of itself.[14] Consequently, Weber puts forward two kinds of rationality:

(i) Technical rationality: this type of rationality can be evaluated against an objective standard, i.e., scientific knowledge of means-ends relationships. Here, calculation is limited to the weighing of alternative means to a fixed and given end;

(ii) Economic rationality: this type of rationality is purely subjective and the calculation is extended to the weighing of

alternative ends and unintended but foreseeable secondary consequences as well as means.

In sum, according to Weber, choosing what means to employ, given a fixed and unambiguous end, is a technical problem; choosing what ends to pursue and what means to employ, given a stock of resources, is an economic problem.[15] These two kinds of rationality may be difficult to reconcile. Consider the example of innovations in security for the workers employed in agricultural dryers. There is a general agreement that numerous explosions are due to agricultural dust. Yet, this problem does not have a technically rational solution, for the goal (i.e., to protect the workers' lives) is only apparently unambiguous. Should lives be protected to the maximum extent technically feasible (as possible by using new processes which eliminate oxygen)? Or to the extent economically feasible (up to the point that the cost of protective equipment would threaten the viability of the industry)? Or to the extent that the benefits of better security outweigh the costs of protective equipment? And in this case, how are the benefits of better security to be estimated in monetary terms? What is the money value of a 3% decrease in deaths from explosions? Clearly, this is not a technical problem at all: agreement on the general goal of protecting the workers masks disagreement over the interpretation of this goal - i.e., over what the specific objective of the management's policy should be.

Actually, Weber's conception of rationality, as should be evident from the preceding lines, is far from unequivocal. The multifaceted rationality of modern man, moreover, is viewed as the product of processes of rationalisation occurring in several distinct spheres of social life, proceeding in various directions and arising from diverse historical sources. Yet, despite this multiplicity of modes of rationality and rationalisation, the

specific and peculiar rationalism of the Weberian actor is not simply a conceptual mosaic, nor a mere aggregation of unrelated elements. Certain thematic strands run throughout Weber's discussions of the rationality of the modern social order, cutting across the boundaries between the different spheres of social life and forming a central core of meaning. Three thematic strands - those of the maximisation of knowledge, impersonality and control - weave together the various aspects of Weber's conception of formal (i.e., not concerned with values or happiness) rationality.

2.1.1.2. Maximisation of Knowledge

According to Weber, to act rationally, in one very general sense of this highly ambiguous expression, is to act on the basis of knowledge. Rational action in this sense is universal: all men in all societies and all epochs (though not, of course, in all of their actions) base their conduct to some extent on knowledge, especially knowledge of means-ends relationships, and of the probable reactions of their physical and social environment to their actions. In modern Western society, however, the rise of systematic empirical science and of scientific technology gives knowledge an importance above and beyond its universal significance as a basis for individual action. This is to be understood in the scope of a movement towards the maximisation of calculability which depends on the "peculiar features of Western science, especially the mathematically and experimentally exact natural sciences, with their precise rational foundations."[16] According to the German sociologist, the search for the maximisation of knowledge is significant also as the chief agent of a more general process of intellectualisation which tends to promote the view of the world as a "causal mechanism" that, in principle, can be mastered by

"technical means and calculation".

An other aspect of intellectualisation is pointed out by Weber: the increasing tendency for the individual to act on the basis of conscious reflection about the probable consequences of his action. Corollarily, this entails an other type of maximisation of knowledge, that of the various consequences of a given action: the corresponding expectations are used as "conditions" or "means" for the attainment of the actor's own rationally pursued and calculated ends.[17] This systematic search for knowledge about possible consequences is made particularly obvious in the classical theory of choice (see Exhibit 5.A.).

2.1.1.3. Maximisation of Impersonality

The Weberian rational actor's behaviour is determined by purely objective, impersonal considerations. Rationalisation, in the direction of increasing impersonality is to be related to the development of legal formalism. If Weber is to be believed, legal formalism increases for the actor the possibility of predicting the legal consequences of his actions since "procedure becomes a specified type of specified contest, bound to fixed and inviolable 'rules of the game'."[18] Consequently, the actor's strategy consists in maximising the impersonality of the legal and administrative environment, whose predictability, according to Weber, is a prerequisite for the rationalisation of economic life.[19] In fact, the Weberian actor acts in a "spirit of formalistic impersonality..., without hatred or passion, and hence without affection or enthusiasm."[20]

2.1.1.4. Maximisation of Control

As noticed by Marcuse, the theme of control - over material objects, over other men, over oneself - pervades Weber's discussions of rationality.[21] Control over material objects tends to maximisation as a result of the maximisation of knowledge. Control over the other actors is operated and may be maximised through the maximisation of specialisation, which reduces the actor to the function he performs,[22] while methodological self-control fosters the actor's rationality, because it is continuous and systematic rather than occasional and haphazard.[23]

2.1.2. The Neo-Classical Economic Actor

The neo-classical economic actor is very germane to the Weberian actor. His "comprehensive rationality" enables him, in a choice situation, to choose the best alternative, taking account of consequences, their probabilities, and utilities. But, as pointed out by Allison, such a strategy requires: (i) the generation of all possible alternatives, (ii) assessment of the probabilities of all consequences of each, and (iii) evaluation of each set of consequences for all relevant goals.[24] March and Simon have described, though not endorsed, this conception of the rationality that would enable such strategies to be implemented:

(i) In a decision-making situation, the actor is able to consider the whole set of alternatives from which he will choose his action;

(ii) The actor is able to attach a set of consequences to each alternative;

(iii) At the outset, the actor is able to design some "utility function" or a "preference-ordering" that ranks all sets of

consequences from the most preferred to the least preferred;

(iv) Finally, the actor is able to select the alternative leading to the preferred set of consequences.[25]

This model has been adapted to risky and uncertain environment by the operational research theory. In the case of certainty, of course, according to March and Simon, the neo-classical (or "rational") problem-solver will choose the maximum position on the welfare function; in the risky case, he will choose the alternative for which the expected utility is greatest, while, in the case of uncertainty, he will choose according to some rule such as "minimax risk" or "minimax regret" (for a more complete characterisation, see Exhibit 5.A.).[26]

This conception, as it appears, inter alia, in Tinbergen[27] or Dimock[28], has the following central characteristics in common with Weber: rationality rests on the maximisation of calculability (through the maximisation of knowledge, impersonality and control, in Weber; through the maximisation of some welfare or utility function for the economists) and strategies are rational only if they aim at maximising calculability, or are based on it.

It has been suggested by Jabes that this conception has its roots in the pleasure principle submitted by the British philosophers Jeremy Bentham and John Stuart Mill.[29] Indeed, the hedonistic approach postulated that man tries to maximise pleasure and minimise pain, but this involves more fundamental considerations outwith the area of this research.

However, this first approach to rationality has been criticised on various grounds, as it will be seen in 2.2. Briefly, the main strictures rest on the super-power it implies. Of course, it is often conceded that these rational requirements are to be understood in terms of ideals (Weber) or models (Dimock) rather than achievement, but the search for a maximum is still viewed as a

prerequisite for rational strategies.

This view has been challenged by two streams of analysis, as will now be seen.

2.2. Rationality as a Function of Minimisation

2.2.1. Non-Comprehensive Rationality

As long ago as 1947, Simon criticised the conception of rationality and the notion of maximisation which were prevailing in the characterisation of the "homo-economicus" by suggesting a model of decision-maker which, according to him, matches reality.

Clearly, the previous model implies some comprehensive, complete, knowledge of the environment and the maximisation of a value based on this information. This involves, in Simon's words, "powers of prescience and capacities for computation resembling those we usually attribute to God."[31] Simon has argued congently that, at any point in time, an individual has only limited information on the state of nature. By focusing on the limits of human capacity in comparison with the complexities of the problems that individuals face, Simon developed the concept of "bounded rationality". The physical and psychological limits of man's capacity as alternative generator, information processor, and problem-solver constrain his decision-making processes. Because of these bounds, "rational" action requires simplified models that extract the main features of a problem without capturing all of its complexity. These simplifications are examined in 2.2.2.

2.2.2. Individual Rational Simplifications

Simon's work identifies five characteristic deviations from

comprehensive rationality that are displayed by the simplifications of human problem-solvers:

(i) Factored problems: problems are so complex that only a limited number of aspects of each can be attended to at any time. Thus, the individual factors problems into quasi-independent parts and deals with the parts one by one.

(ii) Satisficing: maximisation, or optimisation, is replaced by "satisficing". In choosing, human beings do not consider all the alternatives and pick the action with the best consequences. A choice is made when an alternative meets the minimum standard of satisfaction that the individual expects: he searches through available choice alternatives until he hits upon one that is "good enough" - that satisfies. In this respect, it is worth noticing that Soelberg's researches have shown, in the educational field, that search ends when a satisficing alternative is found.[32]

(iii) Search: comprehensive rationality requires consideration of all alternatives, thus making the problem of search trivial. When satisficing is the rule - i.e., stopping with the first alternative that is good enough - the order in which alternatives are turned up is critical.

(iv) Uncertainty avoidance: instead of basing actions on estimates of possible outcomes, the actor develops choice procedures which emphasise short-run feedbacks so as to reduce uncertainty.

(v) Repertoires: repertoires of action programmes are developed and constitute the range of effective choice in recurring situations.[33]

The reason for terming this model of rationality by reference to minimisation should become more clear now. Indeed, "minimisation",

here, is not to be understood in terms of "minimisation of pain or regret", which is rigorously equivalent to the hedonistic principle (i.e., "maximisation of pleasure or satisfaction"). On the contrary, the concept of minimisation refers in the present context to a procedure consisting of defining the lowest acceptable level of satisfaction: the actor is interested in "feasible solutions that meet a minimal standard of satisfaction."[34]

In sum, a rational strategy under conditions of uncertainty and the constraints of the cost and time of obtaining and processing data, moves away from substantive (maximising), towards procedurial (minimising) processes.[35]

To be sure, Simon's view is still exerting a considerable influence on decision-making theories and many authors accept the notion of bounded rationality under a variety of terms (for example, Rawls will call it "deliberative rationality").[36] However, Simon's model is liable to some important strictures, as the following lines show.

2.3. Rationality as a Function of Correlation

In fact, the two models above share a common postulate: be it optimiser or satisficer, the decision-maker is able to decompose problems into sub-problems and alternatives into sub-alternatives since, as epitomised by Richardson and Jordan, the maximisation conception rests on a discrimination among goals, values or objectives, while the minimisation conception refers explicitly (in Simon) to the factoration of problems into "quasi-independent" parts.[37] Actually, this supposed analytic process may be questioned, as suggested by the following lines.

2.3.1. Leibniz versus Descartes

Both the Weberian and the Simonian actors, through their discriminating procedures and ranking of alternatives, implicitly resort to Descartes' canons of rationality. Indeed, these canons, pointed out in the opening pages of the Discours de la methode pour bien conduire sa raison, may be summarised as follows: when faced with a problem, a rational human being will:

(i) Divide the problem into simple elements, as they attach to sub-problems;
(ii) Consider each simple element and solve each sub- problem;
(iii) Re-assemble the simple elements, as they now attach to solved sub-problems: the problem is then solved.[38]

However, as long ago as 1700, Leibniz criticised this analytic method, on the ground that "by dividing a problem into inappropriate elements, one may increase its difficulty." Obviously, the question of how the decision-makers should proceed is beyond the concern of the present research, which is to concentrate on how decision-makers really proceed. But, if Leibniz was right, then one may wonder whether decision-makers really tend to use the analytic method, on which rest both the maximising and the minimising approaches. Therefore, it is of interest to study briefly the alternative view, as proposed by the System Theory.

2.3.2. Analytic and Systemic Rationalities

The Cartesian analytic method first criticised by Leibniz was found more and more misleading as the problems under consideration involved increasing numbers of inter-relationships. It was found particularly difficult to re-assemble the elementary components, once studied, of the problem when the phenomenon was not only an

addition, a juxtaposition of the constituent elements. Actually, the Cartesian method postulates that the elementary components behave in the same way when isolated as when connected: interactions are not taken into consideration by the model.

Consequently, in the 30's, an American biologist, von Bertalanffy, facing the impossibility of understanding some biological phenomena, suggested the idea of a "new theory", termed "System Theory", the objective of which would be to explain how systems operate, by paying a particular attention to the relationships between their elementary sub-components.[39]

In spite of various contributions, among others by Ashby[40] and Forrester,[41] such a theory has not already reached achievement. However, its basic postulates are clearly contrasted with Descartes' by Le Moigne.[42] The differences between the analytic and the systemic rationalities are pointed out in Fig.23.

Fig.23- Paradigms of Cartesian analytic and systemic rationalities

Cartesian Analytic Rationality	Systemic Rationality
Precept of obviousness	Precept of relevance
Reductionist precept	Precept of globalism
Causalist precept	Teleological precept
Precept of comprehensivity	Precept of aggregativity

The Cartesian precept of obviousness enjoins to never accept anything for true which may not be clearly and obviously known to be such.[43] A major piece of criticism of this precept is that obviousness and clarity often mask illusions. Conversely, the precept of relevance admits that obviousness (of truth, validity, etc.) is a function of the actor's purposes when he is faced with a

probem: "matter of factness" depends upon the relevance of the facts to the actor's purposes.[44]

The reductionist precept calls for "dividing each of the difficulties under consideration into as many parts as possible, and might be necessary for its adequate solution."[45] The first strictures to this precept were suggested by Leibniz on the ground that the precept is of little help as long as the "art of dividing" is left unexplained. On the other hand, the precept of globalism suggests that, instead of considering problems as consisting of elementary sub-problems, they must be cogitated as inserted in larger problems which constitute their "problematic environment".[46]

The causalist precept expresses the "necessity" to conduct one's thought step by step, assigning in thought a certain (causal) order to the objects.[47] Against this precept, it has been put forward that one can be rational even if not resorting to the cause-effect (or stimulus-response) model.[48] The "single cause habit", which represents the extreme extension of the precept, was particularly criticised. Conversely, the systemic teleological precept suggests that a given object must not be considered per se, but in relation with its "behaviour", without trying to explain a priori this behaviour by some law involved in an eventual causal structure. Rather, the point is to understand this behaviour, to identify the resources it supposes, in relation with the "project" that the actor deliberately ascribes to the object.[49]

According to the precept of comprehensivity, the rational actor must, "in every case, make enumerations so complete, and reviews so general, that [he] might be assured that nothing was omitted."[50] But some phenomena (in biology, physiology, sociology,...) involving increasing complexity beyond any possible comprehensive account, even with the support of data processing, have led to put forward the systemic precept of aggregativity. This precept emphasises

that any representation is deliberately simpler than the phenomenon it aims at modelling. Therefore, the point is to select relevant aggregates together with excluding the illusory objectivity of a comprehensive census of all the elements involved in the phenomenon.[51]

The above paradigms structure rationality according to the System Theory. However, these paradigms in themselves do not characterise the types of strategy the theory advocates. As it appears through the previous considerations, rationality can only be studied and understood through the strategies it may give rise to. Then, if a strategy is viewed as an implementation of a given rationality, the focus should be now placed on analysing such an implementation.

From the aforesaid, it follows that the basic rationale of the systems approach rests on the emphasis placed upon the liaisons, interactions, and connections between objects or phenomena. When applied to strategies, these categories may be called "correlations", as is suggested in 2.3.3.

2.3.3. Strategy and Degree of Rationality

The cybernetic literature provides, among others, a very clear instance of implementation of the systemic rationality. Postulating that "rationality is a property of the means one chooses and not the ends", Axinn considers that three requirements must be fulfilled by any definition of rationality:

(i) Rationality is to be a property of the means an individual chooses. It must not conflict with the possession and the pursuit of sensual desires;

(ii) There may be degrees of rationality;

(iii) The term "rationality" can only refer to the behaviour of an

individual who has more than one objective.[52]

To satisfy these three conditions, Axinn defines the degree of rationality of a strategy in terms of the degree of positive correlation among the probabilities of attaining each of the objectives of the individual at a specific time and place.[53]

On this basis, an individual would be perfectly rational if his strategy was such that an increase in the chance of reaching one of his objectives brought a corresponding increase in the chance of reaching each of his objectives (in this case, the degree of correlation is maximum and equal to 1). Obviously, the rationality of a given strategy is no longer analytically assessed in terms of the rationality of the means per se, but rather in terms of the coherence of the means as they are inter-related.

In sum, the rationality of the systemic actor's strategy is synthetically assessed (precept of globalism) on the basis of the degree of correlation between adequate means (precept of relevance) combined (precept of aggregativity) in order to achieve a given set of objectives (teleological precept).

2.4. From Individual to Collective Decisions: Efficiency, Legitimacy, Intelligibility

The three "theories" of the paradigm of rationality examined above give rise to various models of collective decision-making. This is not surprising if one considers that collective decisions can be viewed as derived from individual choices.[54] Actually, the gist of the matter lies in the nature of this derivation: most of the models of collective decision-making differ in the way they conceptualise the transition from the individual to the collective levels.

A significant proportion of the literature, be it political,

ideological, or organisational, revolves around a theory of the relationship between micro- and macro- rationalities. According to the focus of analysis, emphasis is either placed on efficiency, legitimacy, or intelligibility. In this respect, three main orientations of reflection may be contrasted, as Fig.24 indicates.

Fig.24- Transition from individual to collective decisions: three basic perspectives

Focus	Key-Concept	Domain	Reference
Policy	Efficiency	History	Excellence
Ideology	Legitimacy	Ethics	Law
Organisation	Intelligibility	Activity	Coherence

2.4.1. Efficient Transition

The first perspective furnishes the core of the Greek philosophers' thoughts on government. According to Plato and Aristotle, collective decisions (i.e., decisions concerning the City) must be made by the "best" citizens, i.e., those who excel: the wisest citizens, or "philo-sophers". Obviously, these analysts are not so much concerned with understanding the way choices are made as assuring the choices are the most efficient. The rationale of collective decisions is to be understood within the scope of a set of political sequences: History consists of more or less accurately predictable cycles.

2.4.2. Legitimate Transition

The second perspective, which was thriving during the Enlightenment period, is mainly concerned with legitimating collective decisions (i.e., decisions concerning the Nation, if not Humanity). The

rationale of the transition is circumscribed by the field of Ethics, and emphasis is no longer placed on efficiency. Rather, the core question is that of the congruency of collective decisions with a would-be universal law. Instances of such a law are the "General Will" (Rousseau), the "Categorical Imperative" (Kant) or, later, the "Felicific Calculus" (Bentham).[55]

2.4.3. Intelligible Transition

The third perspective is fundamentally different from both conceptions reviewed above. When studying collective decisions (i.e., decisions concerning an organisation: administration, firm, university, etc.) the researcher is first interested in penetrating the rationale of these decisions. This is not surprising since this type of analysis aims at predicting further decisions. The domain of this kind of investigation is collective activity in the broadest sense of the word, and may encompass both the other domains as fields of study. As a result, this approach is "merely", but rigorously, concerned with the coherence between the various attributes it aims at coordinating into explanatory and predictive models. Accordingly, this approach may well consider the key-concepts of efficiency (first perspective) or legitimacy (second perspective) as important in terms of intelligibility of a given organisational phenomenon, but they do not constitute the objective of this approach. Rather, the point at issue is to provide conceptual models able to account for a set of organisational decisions. The following section concentrates on reviewing the various models of this type which have already been proposed in the organisational literature.

SECTION 3. THE PROBLEM OF THE AGGREGATION OF RATIONALITIES AND STRATEGIES: ORGANISATIONAL DECISION-MAKING

The concept of model plays an important role in the following lines. This notion has been examined already (Chapter III, 3.3.) and it suffices to say that a model refers here to a simplification and abstraction of organisational phenomena. Actually, the models which are reviewed below must be considered as supports to the understanding of organisational decisions. Most often, they are offered as "non-competitive alternatives for use simultaneously rather than exclusively."[56] Centrally concerned with the collective implementation of strategies and rationalities, this review aims at sidestepping the intellectual trap within which, according to Allison, studies of decision-making can easily become ensnared: that explanation should become dominated by an entirely implicit conceptual framework which would structure the whole process of enquiry.[57]

3.1. Allison's Three Models

Allison's seminal analysis was first carried out in the scope of policy-making, and proposed three alternative models for explaining the U.S. strategy during the Cuban missile crisis of October 1962. However, the richness of his conceptual framework is such that it has been resorted to in almost all the study fields likely to involve organisational contexts: bureaucracy (Crozier),[58] judicial processes (Mohr),[59] multinational firms (Ghertman),[60] finance (Belkaoui),[61] etc.

Accordingly, Allison's contribution may prove of interest as a possible intellectual support to the study of the relationships between managerial rationalities and strategies (as dimensions of the organisational climate) and the decisions related to the

acceptance of industrial innovations.

3.1.1. The Rational Actor Model ("Model I")

A number of bodies of literature are related to this model. One consists of reports on the use of normative procedures, such as operations research or programme evaluation, in organisational decision-making.[62] Another consists of investigations of the apparently rational use of information by individuals in simulated organisational environments.[63]

According to Allison's Model I, at the collective level (group, organisation, government,...), the unit of analysis is simply defined as if it were a coherent and monolithic entity with an individual consciousness. Thus, organisation becomes an undifferentiated black box which: (i) seeks to maximise profit and (ii) operates with perfect knowledge.[64]

Such a conception rests on a combination of the Weberian[65] and the neo-classical economic[66] rationalities and plays a central part in the neo-classical theory of the firm.[67] According to the model, an organisational decision is thus explained once it is shown how a firm, faced with a given problem (say, choosing between resorting to an innovative industrial process or not) has:

(i) Established its objectives and ordered them according to organisational desirability;
(ii) Searched all the alternative possibilities for achieving its objectives;
(iii) Settled upon the alternative ("choice") which maximises the firm's objectives or minimises the costs of possible failure.[68]

Consequently, predictions about what a firm will decide are

generated by calculating the rational alternative to choose, in a certain context, given specified objectives. According to Allison, although Model I "has proved useful for many purposes, there is powerful evidence that it must be supplemented."[69] What Allison was noticing in policy analysis had already been indicated by Cyert and March, in their characterisation of the neo-classical theory of the firm.[70] Briefly, this model has been criticised on the grounds that "an organisation should not be considered as some sort of super-individual behaving as a true individual but with greater information-handling and calculation capacities."[71] Accordingly, Allison provided an alternative model, which is explained in 3.1.2. below.

3.1.2. The Organisational Model ("Model II")

This model deals with the problem that there is a real difference between an individual decision-maker and an organisation.[72] According to Model II, an organisation does not have, in practice, a single set of goals with an agreed order of preference amongst them, nor does it carry out a similar search process amongst its means, as an individual might. Here, the actors do not form a unity, but rather a constellation of individuals in organisation. Problems are factored into sub-problems and are then acted upon by individuals with constrained powers, according to established routines and procedures, under the control of a central coordination.

If unexpected problems are faced, the search for an answer will be biased by tradition and by the training of the actors. The firm is viewed as a conglomerate of sub-organisations, each with programmed strategies according to established rationalities: innovation is bound to be marginal and incremental, except in case

of crisis. These strategies may be of various forms, and focus on: personal security, professional identity, professional links, personal risk-avoidance, etc.[73] According to this approach, an organisational decision is thus explained once:

(i) The organisational context and pressures, from which the decision ("output") emerged, are identified;

(ii) Certain concepts such as the strength, standard operating procedures, and repertoires of the firm are assessed;

(iii) Certain pattern of inference is invoked (e.g., if such a decision was made, this "output" resulted from such existing organisational features, procedures, and repertoires).

Consequently, predictions identify trends that reflect sub-organisations (of the firm) and their fixed procedures and programmes. Yet, even this approach, Allison argues, still fails to catch the whole reality. Therefore, another mode of analysis must be resorted to.

3.1.3. The Political Bargaining Model ("Model III")

Any model of organisational decision-making aims at resolving the problem of collective choice. Model I's solution is to impose an individual "perfect" rationality on the various actors and thus to fuse individual and collective strategies. Model II's solution emphasises the role of established rationalities and programmed strategies in reducing the effects of uncertainty. Both conceptions neglect the possibility that underlying any collective decision is a process of bargaining, with its own rules of the game, in which outcomes are determined by the relative resources devoted by each actor to the achievement of some satisfactory solution. Accordingly, Model III [74] suggests that when faced with a decision

problem, participants focus upon those aspects of the problem which they perceive as affecting their parochial interests.[75] Consequently, the decision-making process is complicated by competing problems (to be related to competing rationalities) and competing preferred solutions (to be related to competing strategies) in an attempt by each participant to ensure that any final decision is not damaging to their interests. According to Model III, an organisational decision is thus explained once:

(i) The relevant participants ("players") along with the rules of the game are identified;

(ii) Certain concepts such as the perceptions, motivations, positions, power, manoeuvres (rationalities and strategies) of the players are assessed;

(iii) Certain pattern of inference is invoked (e.g., if a firm made such a choice, the decision was the resultant of such kinds of bargaining among such players in games).

Consequently, predictions are generated by identifying the game in which an issue will arise, the relevant players, and their relative resources and rationalities. It is to be noticed that, in this case, the choice mechanism is domination, i.e., the goals most satisfied are those most favoured by the most powerful (in terms of arguments, resources, time available, etc.) unit.

As confessed by Allison, his three models are greatly influenced by the behaviourist models, which are characterised below.

3.2. The Behaviourist Models

This approach encompasses, among others, two central contributions to the understanding of organisational decision-making: that of Simon and, in Simon's wake, that of Cyert and March.

3.2.1. Simon's Three-Levelled Model of Integration

Echoing Simon's conception of individual bounded rationality, a model of organisational bounded rationality is developed.

3.2.1.1. Organisational Rational Simplifications

Corresponding to the five individual characteristic deviations from comprehensive rationality, Simon suggests five analogous organisational simplifications:

(i) Factored problems: organisations factor complex problems into a number of roughly independent parts which are parcelled out to various organisational units. If problems are factored by means-end analysis, each organisational sub-unit may be assigned separable pieces of a problem as sub-goals. Consequently, the structure of an organisation reflects the problem that its sub-units factor;

(ii) Satisficing: here again, maximisation or optimisation is replaced by "satisficing". This means that organisations do not examine all the alternatives, but stop the search for the "best" one as soon as a solution which is good enough is identified (i.e., the minimally acceptable alternative);

(iii) Search: satisficing procedures render of paramount importance the order in which alternatives are turned up. According to Simon, organisations generate alternatives by relatively stable, sequential search processes. Consequently, the number of examined alternatives is severely limited;[76]

(iv) Uncertainty avoidance: a comprehensive rationality supposes that each alternative consequence be assessed by estimating probabilities (in a non-certain environment) of possible outcomes. However, organisational rationalities are not

content with basing actions on estimates of an uncertain future. Consequently, choice procedures that emphasise short-run feedback are developed;[77]

(v) Repertoires: organisations develop repertoires of action programmes, which constitute the range of effective choice in recurring situations.[78]

3.2.1.2. Bounded Rationality of Decisions, Orientation of Conducts, Integration of Behaviours

Fig.25 sums up the three levels of Simon's theory of decision-making: bounded rationality, orientation of conducts, and integration of individual behaviours by organisations.

Fig.25- The three levels of Simon's model of organisational decision-making

Level of Integration	Level of Orientation	Level of Decision
Division of work	Learning, memory	Decision-maker
Standard practices	Habits, routines	Satisficing
Internalisation (values, objectives)	Stimuli	Planning
Consensus area (authority, communication)	Recurring responses	Pre-determined alternatives

[This table is explained in the following lines.]

The integration of the actors' behaviours is viewed by Simon as resulting from a process involving three principal steps:

(i) Substantive planning, by which broad decisions are made;

(ii) Procedural planning, by which mechanisms that will direct attention, channel information and knowledge are established;

(iii) Implementation of the plan through day-to-day decisions and activities that fit the framework provided by steps (i) and

(ii).[79]

In fact, the integration is brought about by decisions that determine in very broad terms the values, knowledge, and possibilities that will receive consideration.[80] Consequently, Simon builds up a hierarchy of the types of decision, and defines the organisational influences on the actors.

Hierarchy of Decisions

According to Simon, actual events are determined by choices among on-the-spot alternatives for immediate behaviour. In a strict sense, as Simon notices, a decision can influence the future in only two ways:

(i) Present behaviour, determined by this decision, may limit future possibilities;

(ii) Future decisions may be guided to a greater or lesser degree by the present decisions.

Simon concludes that it is from this possibility of influencing future choices by present decisions that the idea of an interconnected plexus of decisions is derived.[81] Over recurring decisions, a conscious reflection process implementing a specific rationality may be operated, which will result in a selection of (i) particular values as criteria for the later decisions, (ii) particular items of empirical knowledge as relevant to the later decisions, (iii) particular behaviour alternatives as the only ones needing consideration for later choices.[82] This remark supports the suggestion that organisational climate may develop over decision situations, inasmuch as the latter may foster particular values. On the other hand, the process of conscious reflection on later decisions defines the concept of "planned" behaviour as the proper

means for maintaining rationality at a high level.[83]

Such procedures, however, require that all the possible plans be worked out in full details before any decision is reached, which is impossible, according to Simon. Accordingly, Simon concludes that the "planning procedure is a compromise, whereby only the most 'plausible' alternatives are worked out in detail."[84]

Organisational Influences on the Actor

These influences are of two types:

(i) Organisations and institutions permit stable expectations to be formed by each member of the group as to the behaviour of the other members under specified conditions. Simon views these stable expectations as essential preconditions to a rational consideration of the consequences of action in a social group;[85]

(ii) Organisations and institutions provide the general stimuli and attention-directors that channel the behaviours of the members of the group, and that provide those members with the intermediate objectives that stimulate action.[86]

The two types of organisational influences give rise to five organisational mechanisms of influence:[87] (i) division of work; (ii) communication; (iii) internalisation; (iv) standard practices; (v) authority.

3.2.1.3. Rationality in Simon's Model

Simon's model draws on economic, psychological, sociological and managerial concepts. Consequently, one must not expect simple and comprehensive relationships between either the concepts or the

various levels of the model. However, it is worth noticing that Simon considers as synonymous a "high level of organisational rationality" and a "high level of achievement of the organisational objectives." Accordingly, his model constitutes rather a normative approach to organisational influences on individual rationalities: the rationality of the model rests on the notion of hierarchy, which "is the adaptive form for finite intelligence to assume in the face of complexity."[88]

3.2.2. Cyert and March's Coalitional Model

3.2.2.1. Comprehensive and Relational Variables

Cyert and March have conceptualised a behavioural theory of the firm which formalises some of the laws suggested by Simon. Cyert and March's theory connects individual decision-maker and organisation by considering the latter as a set of coalitions of individuals. Their conception encompasses three categories of comprehensive variables and four relational concepts. The three comprehensive variables are:

(i) Organisational objectives, factorable into (a) objectives dimensions (i.e., production, sales, inventory, market shares, profit) and, (b) level of aspiration for each dimension of the objectives;

(ii) Organisational expectations, including (a) forecast competitors' behaviours, (b) forecast demand and, (c) estimated costs;

(iii) Organisational choices, which may be developed either (a) in response to a sudden problem, or (b) through standard procedures.

The standard operating procedures exert a major impact on decision-making behaviour within the firm by means of the following influences:

(i) Effects on individual goals within the organisation. The specification of a plan has a direct effect on the desires and expectations of organisational members;

(ii) Effects on individual perceptions of the state of the environment. Different parts of the organisation see different environments, according to their rules for recording and processing information;

(iii) Effects on the range of alternatives considered by organisational actors in arriving at operating decisions. The way in which the organisation searches for alternatives is substantially a function of the organisational operating rules;

(iv) Effects on the managerial decision rules used in the organisation. These rules are frequently specified explicitly.[89]

The four concepts that determine the relationships between the comprehensive variables are the following:

(i) Quasi-resolution of conflict, which involves goals that operate as aspiration-level constraints imposed by the demands of coalition members;

(ii) Uncertainty avoidance, which is accomplished by focusing on more predictable short-term environments and short-run feedback or by arranging a negotiated environment;

(iii) Problematic search, which is concerned with engineering a solution to a specific problem, a solution which is motivated, simple-minded to the degree possible, and biased by the prior training, hopes, and conflicting goals of those involved;

(iv) Organisational learning, which results in changes and adaptations in goals, in attention rules, and in search rules.90

3.2.2.2. Rationality in Cyert and March's Conception

In sum, Cyert and March consider the firm as a set of partisan rationalities, in which the choice mechanism rests on the implementation of standard procedures. Because of the antagonism between rationalities, each decision must be viewed as the sequential satisfaction of contradictory criteria.

Collective organisational decision-making, in Cyert and March's approach, is a function of the substance of the intellectual processes inherent in the various organisational decision-makers. These processes abide by rules and procedures. They may be more realistic than those postulated by the Neo-Classical Theory, but they still result from viewing the implementation of the actor's rationality (through strategies) as amenable to scientific study. Therefore, Cyert and March do not differ so much from the Neo-Classical Theory as they seemingly attempted to do. To achieve such a distinction would require a change in the scope of the scientific analysis, by moving from the study of intellectual processes to that of the political processes within the organisation.

Furthermore, Cyert and March's model of organisational decision-making has been criticised, among others by Ansoff, on the grounds that it only applies to administrative decisions.91

3.2.3. The Garbage Can Model

As previouly noticed, throughout Simon's writings one finds an

implicit, normative underpinning that says that some type of rationality, to the extent it is possible, is always to be desired (since it results in the achievement of the objectives). In contrast, Cyert and March's conception is much more descriptive than prescriptive. This departure from a normative model of rationality is magnified in the Garbage Can Model of decision processes.

3.2.3.1. Sources of Ambiguity

From the outset, the model questions three commonly received categories of rationality, which are:[92]

(i) The principle of reality: what appeared to happen did happen;

(ii) The principle of intentionality: what happened was to happen;

(iii) The principle of necessity: what happened had to happen.

To these three categories, March and Olsen oppose the central concept of ambiguity. According to March and Olsen, the actors (i.e., the participants in the decision-making processes) often differ in significant ways among themselves or differ in significant ways from the interpretation that the outside observers report. In order to sort out the complications of developing an understanding of participant reports, March and Olsen advocate an understanding of belief structures in an organisation under conditions of ambiguity.[93] This ambiguity is factorable as follows:

(i) Ambiguity of intention: it is often impossible to specify a meaningful preference function that satisfies both the consistency requirements of the theory of choice (see Exhibit

5.A.) and the empirical requirements of describing organisational motives;

(ii) Ambiguity of understanding: for many organisations, the causal world in which they live is obscure. It is hard to see the connections between organisational actions and their consequences.

(iii) Ambiguity of history: often, according to March and Olsen, what happened, and whether it had to happen are all problematic;

(iv) Ambiguity of participation: at any point in time, individuals vary in the attention they provide to different decisions; they vary from one time to another. As a result, the pattern of participation is uncertain and changing.[94]

In this respect, three main types of participation are identified by the model:

(i) Unsegmented participation: in this structure, any decision-maker can participate in any active choice opportunity;

(ii) Hierarchical participation: both decision-makers and choices are arranged in a hierarchy such that important choices must be made by important decision-makers and important decision-makers can participate in many choices;

(iii) Specialised participation: each decision-maker is associated with a single choice and each choice has a single decision-maker. Decision-makers specialise in the choices to which they attend.[95]

Furthermore, the model suggests that organisational mechanisms are developed for ascribing meaning, relevance, and priority to different types of inputs. Through classifications, categorisations, and recordings, organisations try to provide stability in the ways events are observed, evaluated, interpreted,

and combined.[96] It is to be noticed that this contention supports the hypothesis that organisational climate influences decisions (including those related to the acceptance of industrial innovations) through the channel ("interface") of implemented rationalities and strategies.

Actually, the model considers an organisation as a collection of rationalities looking for problems to deal with, strategies looking for decision situations in which they might be implemented, solutions looking for issues to which they might be the answers. Accordingly, the model represents a choice opportunity within an organisation as a garbage can into which various problems and solutions are dumped by participants.[97]

3.2.3.2. Rationality in the Garbage Can Model

In this model, the concept of rationality is increasingly moving away from any normative connotation. Rationality is viewed as nothing else but a procedure: a procedure for deciding what is correct behaviour by relating consequences systematically to objectives.[98]

The organisation integrates individual strategies by developing a consistent theory of itself that incorporates the mix of recent actions into a moderately comprehensive structure of goals. Accordingly, the rationality of organisational strategies is ascribed a posteriori.[99]

Moreover, since, according to March and Olsen, a choice process provides an occasion for executing standard operating procedures, fulfilling role-expectations, duties, etc., it does not seem too hazardous to suggest that choice situations enable organisational climate to be reinforced.[100]

Further, rationality is no longer considered as the neutral and

correct application of given logical rules to concrete cases, but as an attribute of idiosyncratic processes by which decision-makers have to establish the value premises themselves, have to propose rules of the games... once the game is played (i.e., once the decisions are made).

In sum, the organisation ("organised anarchy") is viewed as a set of ambiguous rationalities, in which the choice mechanism is "strategic agglomeration", i.e., a decision relative to a goal is rendered only if the latter happens to be under consideration when a choice on some other matter ("the central choice") is actually made. In this model, organisational decisions are viewed as consequences of intersections of problems looking for solutions, solutions looking for problems, and opportunities for making decisions.

As regards the validity of the model, it is worth noticing, however, that research evidences in support of it are not sufficient already.

3.3. Sfez's Psychological Model

3.3.1. Organisational Codes

Sfez builds his model on the postulate that organisational actors are psychologically involved in the substance of organisational decisions: (i) firstly, according to their own systems of values and preferences; (ii) secondly, because decisions may confer authority and achievement to the actors participating in the decision-making process.[101]

This feature of the actors' libido determines a preference for activities, choices, and procedures associated with sets of other actors: the preference reproduces by strengthening values or affective links, but it may change with new situations likely to

give rise to different values, to break some affective links or to tie up others.

The organisation is viewed as a coalition of sub-systems, each sub-system "enjoying" its own code (procedures, programmes, values, etc.). The integration of the various individual rationalities is operated by a "super-coder". A super-coder is an individual who, owing to the position he has within the organisation, is able to read various codes. Belonging to various sub-systems simultaneously, he can "read" all their codes, and this simultaneous interpretation confers him with an undisputed pre-eminence within the decisional circuit.[102]

3.3.2. Rationality in the Psychological Model

Actually, the model considers the actor's rationality as dependent upon his libido, and each choice is to be undertood in terms of libido satisfaction. Sfez derives his model of collective decision-making from the hypothesis that the features of the integration of the individual rationalities can be explained by some laws analogous to those of Freudian psycho-analysis: the actor's strategy is to participate in decision-making processes inasmusch as this enables his libido to be satisfied through identification and social relationships. This body of hypotheses gives rise to two main pieces of criticism.

The first is that Sfez's model admits as an axiom the strictest psycho-analytical view of the determination of future behaviours by past experiences, the latter being restricted to those of childhood. This thesis is far from being universally accepted.[103]

The second piece of criticism, a more crucial one, addresses the validity of Sfez's analogy between the genesis of the organisation and that of the individual himself. Actually, nothing proves that

decisions are more influenced by the past of the organisation than by the contemporary actions performed by its actors. The psychological model substitutes for the current implementation of the actors' rationalities and strategies nothing but organisational inertia.

3.4. A Cybernetic Model

3.4.1. The Firm as a Network of Black Boxes

The foundations of the Cybernetic Theory have been laid by Wiener. Wiener's central thesis is that any given collectivity can be understood only through the study of the messages and means of communication inherent in this collectivity.[104]

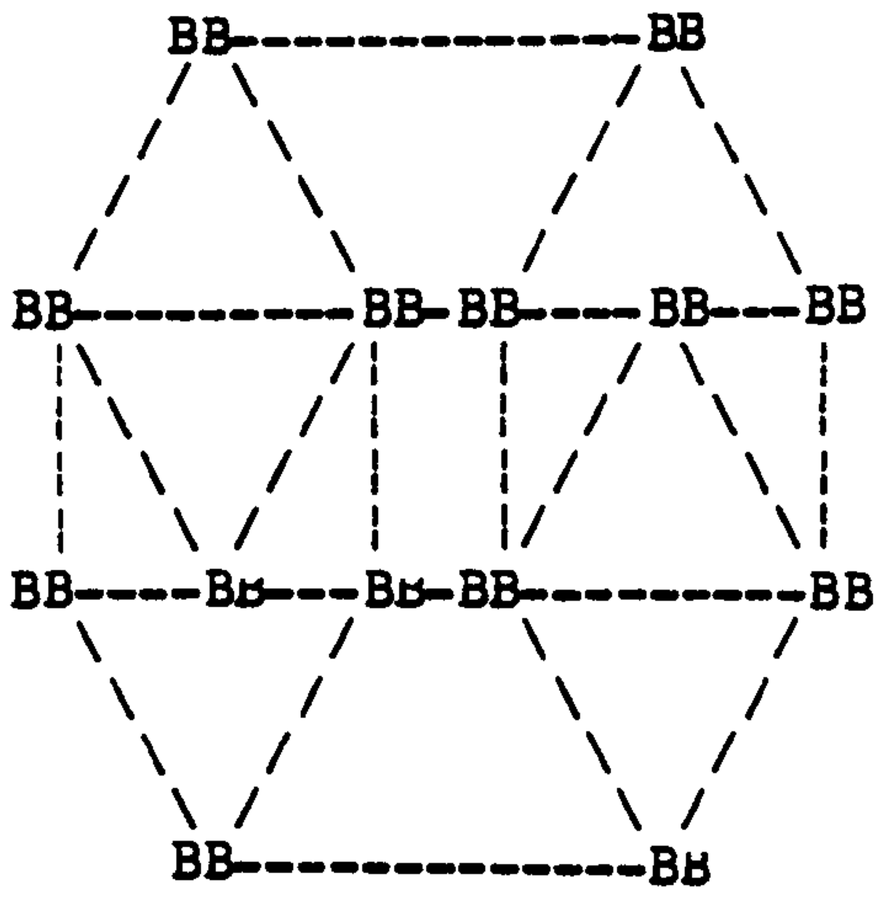
A tentative adaptation of cybernetics to the study of organisational decision-making has been put forward by Appell.[105] Appell views an organisation as a network of decisions that are induced by a given context, by requirements, needs and constraints which develop independent of the structures, problem-solving procedures, decision-support systems, the nature or the validity of the latter, and the decision-makers' psychology.[106]

Accordingly, the model provides a "cartography" of the firm, a set of loci where a multiplicity of decisions are made. The firm is no longer considered as a fascicle of lines converging towards a point, but rather as a polyhedron (see Fig.26).

To each angle of the polyhedron corresponds a "black box" (i.e., a decision-maker faced with constraints and problems to solve), to which arrive information sequences emanating from other decision-makers, and from which transformed ("processed") sequences of

information are emitted for the benefit of these decision-makers (feed-back) or that of other decision-makers faced with different constraints and pressing problems.[107]

Fig.26- The Network of black boxes



3.4.2. Rationality in the Black Boxes

This model formalises the firm as a polyhedron of independent decision centres. The model is of the cybernetic kind inasmuch as:

(i) The organisational process rests on the concepts of feed-back and communication;

(ii) Information is viewed as a neutral, disincarnated (mathematical) flow between impersonal loci (black boxes);

(iii) It neglects the hierarchical aspect of organisations.

Each black box stands as a particular rational node. However, the model sidesteps the difficulty of defining the contents of the various rationalities since each decision centre is viewed as a black box about which, by definition, nothing can be said.

Accordingly, strictly speaking, the model does not formalise any integration of the various rationalities: they constitute a particular network of co-operating formal units which responds to

the environment requirements (inputs) by means of logical decisions and actions (outputs) operated on the basis of neutral communication.

3.5. Crozier's Model of Uncertainty-Absorbing Organisations

3.5.1. Decision and Power

Crozier's main proposition is that the students of decisional processes within organisations cannot neglect the actors' hidden motives and interests at stake.[108]

Crozier views the "organisational game" as the fraction of uncertainty that each actor tries to impose on others within the framework of the rules accepted by the organisation, these very rules being sometimes at stake too.

Accordingly, the integration of the various rationalities is to be understood within the framework of an organisational calculus by means of which each actor tries to transmit to others a fraction of uncertainty in order to maintain or magnify his power.

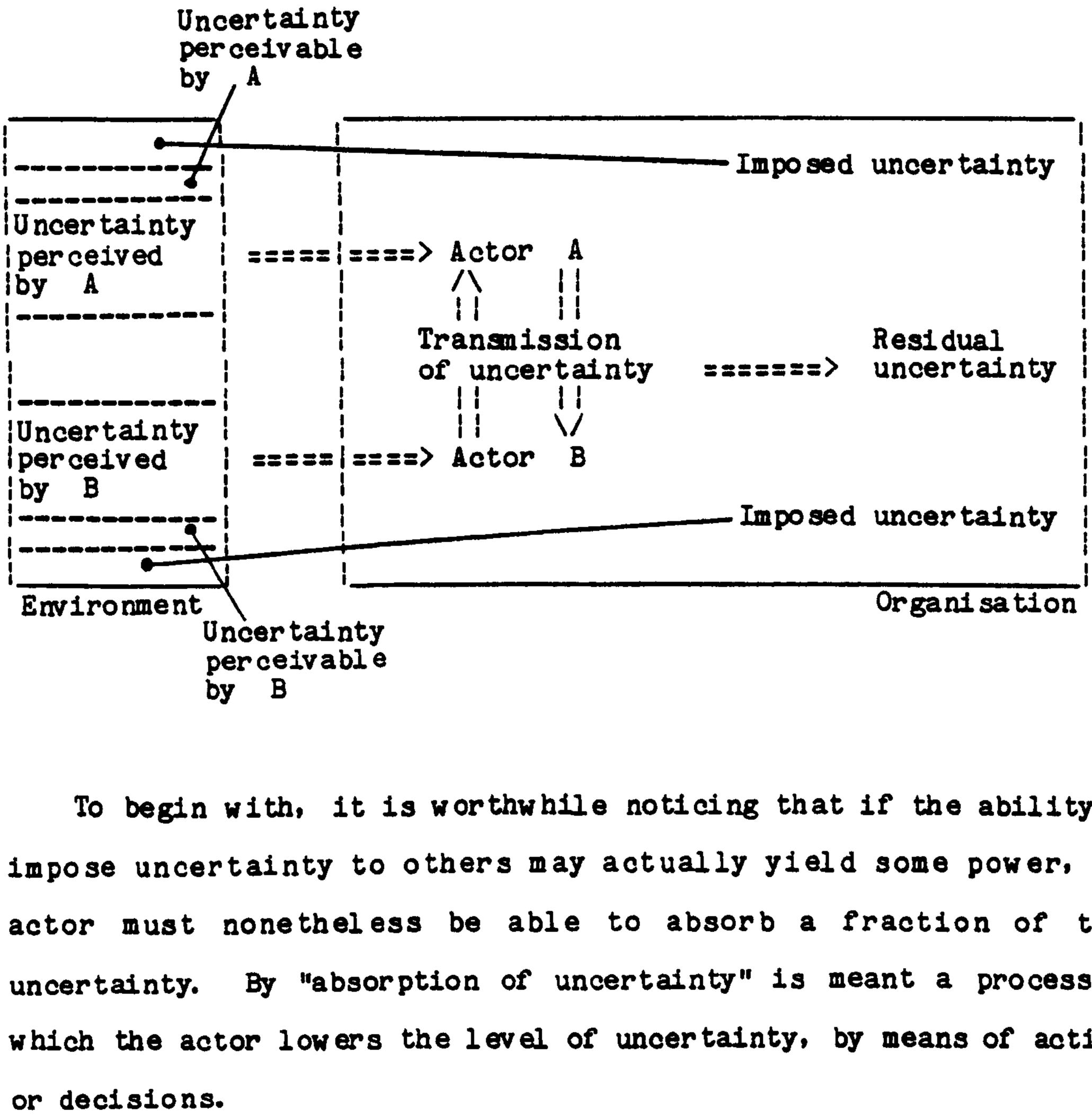
The management of the organisation aim at controlling its environment and, to do so, deal with reducing the global uncertainty the organisation is faced with.

Each actor plays a part in (i) the perception of the uncertainty involved in the fraction of environment he is concerned with, and (ii) the reduction of this uncertainty.

Fig.27 illustrates this process (the organisation reduces to two actors in order to make the process easier to understand,... and explain), including the "power game" between the actors, i.e., the transmission of uncertainty, while pointing out the residual uncertainty for the organisation. By "transmission of uncertainty" is meant a process by which an actor either retains information or

induces other actors to cope with situations about which they have little or no information.

Fig.27- Transmission and absorption of uncertainty



To begin with, it is worthwhile noticing that if the ability to impose uncertainty to others may actually yield some power, the actor must nonetheless be able to absorb a fraction of this uncertainty. By "absorption of uncertainty" is meant a process by which the actor lowers the level of uncertainty, by means of actions or decisions.

The capacity to reduce environmental uncertainty may be equated to technical skill. According to the model, individual power results from a subtle balance of absorbed uncertainty and transmitted uncertainty.

On the basis of the uncertainty he perceives and that he receives from others, the actor is induced to absorb and to transmit a fraction of uncertainty. The uncertainty being transmitted here and there is more or less reduced by means of bargaining procedures,

and from the process will result a certain level of residual uncertainty for the organisation.

The over-all organisational uncertainty is therefore a function of (i) each actor's capacity to absorb uncertainty, (ii) the "power games" within the organisation, and (iii) the organisational bargaining possibilities.

However, Crozier's strategic approach considers that the actors can be affected by zones of uncertainty generated by the organisation itself, and not only by uncertainty inherent in the organisation's environment. In fact, the concept of "zone of uncertainty" refers to phenomena and processes whose implications and outcomes are perceived as uncertain by one actor at least.

This approach takes the view that most zones of uncertainty are stake-related. The concept of "organisational stake" refers to what actors may lose or win out of a given organisational process ("organisational game"); more generally, a stake can be seen as what an actor must secure so as to achieve his strategy.

Instances of organisational stakes are: the autonomy of a given department, the promotion of an actor, etc. An "organisational game" generally hinges on a decision-making process in which actors may decide to take an active part.

Whether they decide to "play" or not, tney may have some stake in the game. Any given organisational game is viewed as generating various zones of uncertainty (e.g. Which actors will participate, what will be their individual strategies, what will be the outcome of the process,... ?). Each zone of uncertainty affects each actor differently, according to his perception of what he has at stake.

In sum, Crozier considers the firm as a coalition of strategies, in which uncertainty is absorbed and transmitted. In this respect, any decision is to be viewed as an exchange of uncertainty: the decision-maker has absorbed a fraction of the uncertainty perceived

by the other actors, who now are uncertain of the outcome of the decision.

3.5.2. Rationality and the Absorption of Uncertainty

The conceptual framework of the model described above formalises the actor's rationality as an ability to implement strategies which enable him (i) to perceive more uncertainty, (ii) therefore, to absorb more uncertainty (which increases his status), and (iii) to transmit more uncertainty to others (which increases his power).

In this respect, it is to be recalled that the actor's rationality, though bounded, is irreducible, i.e., a postulate of the model is that each actor is always able to retain a minimum level of information (and therefore master a minimum level of uncertainty) which enables him to perform his own strategy. Furthermore, it may be noticed that, according to the model, the residual uncertainty is likely to be all the more slight as these strategies develop.

3.6. Fuzzy Models of Collective Decision-Making

3.6.1. Fuzzy Set Theory and Decision-making

The Fuzzy Set Theory, originally suggested by Zadeh, may be regarded as a theory for dealing with the imprecision and uncertainties which are associated with classes in which the transition from membership to non-membership is gradual rather than abrupt.[109]

If Zadeh is to be believed, such classes play an essential role in human cognition, and it is for this reason that the Fuzzy Set Theory has a high degree of relevance to policy analysis and information systems: "in the case of such systems, cognition,

reasoning and communication form the cornerstones of their foundation [that of fuzzy sets]."[110]

Consequently, "cognition, reasoning and communication" being at the core of decision-making, the present chapter could not ignore the contribution of fuzzy set theorists to the problem under consideration, although most of the organisational literature has not paid, hitherto, a great deal of attention to them.

However, the properties of fuzzy decision-making problems have been studied as long ago as 1970, by Bellman and Zadeh.[111] Generally speaking, the fundamental argument is that of reconsidering the classical procedures of choice as formalised, among others, by Luce and Raiffa[112] or Savage,[113] and, more recently, by de Finetti,[114] in the light of the axioms of the Fuzzy Set Theory.

Consequently, the study of how groups arrive at a decision is increasingly carried out through fuzzy mathematical models. Blin and Whinston, following Zadeh's suggestions, first considered the possibility of using fuzzy sets to model the process of group decision-making, by constructing a fuzzy relation (i.e., a relation involving various degrees of association, or preference) over the set of alternatives under consideration by a group.[115]

Ragade also studied fuzzy relations on the set of alternatives but his model is worked at a very theoretical level and would lend itself to experimental verification with a lot of difficulties.[116]

More recently, Spillman, Bezdek, and Spillman have developed an "instrument" for the dynamic measurement of consensus which may be experimentally administered to on-going groups and analysed using fuzzy mathematical techniques to reveal the dynamics of consensus formation. However, owing to the technical difficulties involved in fuzzy modelling, the model has hitherto been applied to rather small groups (i.e., from four to eight members).[117]

3.6.2. The Rationality of Approximate Reasoning in Fuzzy Processes

As indicated above, the simplest notion of fuzzy sets is a generalisation of the ordinary concept of sets to the case where the memberships of the elements are not clear-cut, or, in other words, the "boundary" of the sets under consideration is not strongly defined.

Actually, the notion of fuzzy sets is used to the advantage that it is a convenient tool for dealing with situations involving uncertainty. This may be due to the fact that, according to some researchers, in many real world problems, human beings have more to do with fuzziness rather than randomness (cf., the classical theory of probabilities) for the major sources of imprecision and uncertainty.[118]

Accordingly, the fuzzy models of decision-making processes differ from those of the classical models of choice which assume that the decision-maker can select a set of multi-objectives which meet all his requirements. Rather, it is believed "that it is more realistic to assume that a decision-maker has some vague or fuzzy preference for various sets of objectives."[119]

This leads to the concept of "approximate reasoning" on which, according to Zadeh, rests the logic of fuzzy sets.[120] This approximate rationality is derined as a " type of reasoning which is neither very exact nor very inexact."[121] However, "approximate reasoning" seems very similar to Simon's bounded rationality, as Zadeh adds that approximate reasoning "plays a basic role in human decision-making, because it provides a way of dealing with problems which are too complex for precise solution."[122]

As regards the integration of the various approximate rationalities involved in a collective decision-making process, two

aspects must be distinguished:

(i) The conceptual formalisation of the models, concerned with ascribing meaning to, and describing the nature of, the processes involved;

(ii) The mathematical formalisation of the models, concerned with ascribing values (numerals) to, and describing the mathematical relationships that could account for, the processes involved.

The present research is not interested in the second activity, which inherently rests on the validity of the experimental settings and, so far, has proved able to handle decision process within small groups only. Unfortunately, very little of the fuzzy set researches are devoted to the conceptual activity, and, above all, the rationale of the classical model of integration remains unchanged. For example, Fung and Fu's model still deals with associating a set D of alternatives with a set of m individuals involved in the decision-making process.[123] The only difference from the classical model is that the degree of preference of every individual for each alternative may range from 0 to 1 unstead of being equated either to 0 (rejection) or 1 (choice).

As a conclusion, the conceptual contribution of the fuzzy set theory remains very similar to Simon's suggestions: actually, it looks as though the former was a mathematical application of the latter.

In sum, the group can be seen as a set of gradual (i.e., not clear-cut) preferences, in which a decision stands as a "fuzzy consensus" on some course of action aiming at maximising a fuzzy function of satisfaction. By using the concept of "group" instead of "firm" or "organisation", it is aimed at enhancing that the fuzzy

models dealt with here were not originally conceived in the scope of organisational theory.

3.7. Recapitulation on Decision-Making

The variety of the models examined above suggests that organisational decision-making is not as neutral as suggested by Barnard's contention that "organisational decisions do not relate to personal purposes, but to organisation purposes."[124]

A more recent approach takes the viewpoint that organisational decision-making is the process by which one or more organisational units make a decision on behalf of the organisation.[125] Even this definition is not entirely congruent with all the models reviewed here. For example, to what extent can it be said that the problematic outputs of the Garbage Can process are decisions made on "behalf of the organisation"? The same applies to the Coalitional Model and Crozier's. Then, is that to say that some organisational decisions have nothing to do with rationality? Indeed no, and as should be clear now, it is a matter of definition of rationality.

Accordingly, the gist of the matter is to understand the types of rationality and strategy whose "accretion", as Weiss has it, results in what may be called an organisational decision.[126] In this respect, and accordingly with Huber's contention that "a close reading of the descriptive literature on organisational decision-making.. suggests that more than one model is necessary to describe what happens in most decision situations", various conceptions of rationalities and strategies both at the individual and collective levels have been considered.[127] Fig.28 and Fig.29 offer a digest of this review.

Fig.28- Basic categories of the three conceptions of individual rationality

	Rationality as a Function of:		
	Maximisation (Type I)	Minimisation (Type II)	Correlation (Type III)
CATEGORIES	Reductionism	Reductionism	Globalism
	Comprehensiveness	Simplification	Aggregation
	Analysis	Analysis	Synthesis
	Optimising	Satisficing	Coordinating
	Deduction of the solution	Acceptance of a solution	Reconciliation of the solutions

According to the first conception, an actor will implement a rational strategy if he first analyses a problem and reduces it into sub-problems, then considers the collectively exhaustive alternatives, and deduces the solution which maximises his satisfaction (Type I rational strategy).

According to the second conception, an actor will implement a rational strategy if he first analyses a problem and reduces ("factors") it into sub-problems, then - on the basis of his bounded information - generates a limited number of alternatives, and accepts the first solution which is good enough, knowing that other solutions may exist, at the expense of more costly and time consuming research (Type II rational strategy).

According to the third conception, an actor will implement a rational strategy if he first considers the problem as a network of inter-relationships, then concentrates on the latter as they give rise to an aggregate of objectives to be attained, and coordinates

his action so as to reconcile the related solutions (Type III rational strategy).

These three types constitute basic orientations, and could be related to the more specific conceptions of individual rationalities and strategies which appear in the models of organisational decision-making.

Despite their variety, these three conceptions are rather normative, even the second one. In the light of the above reviewed conceptions, a less prescriptive approach may be resorted to in the present research. In any case, any viewpoint on rationality supposes that certain fundamental basic concepts have received some attention, and been characterised.

However, at this stage, nothing but tentative and "interim" definitions can be proposed. More accurate definitions will be provided in the light of the empirical findings (see Chapter VIII).

ENVIRONMENT

> A set of more or less accurately perceivable objects or phenomena; when these entities are already existing, they belong to an actual environment, when they are not, they belong to a virtual environment;[128]

MEANS

> An element of the environment, liable to be used to transform other actual elements of the environment;

ACTION

> A combination of means resulting in a transformation of the actual environment;

END

A desired virtual element of the environment, liable to result from adequate implementation of actions;

RATIONALITY

A basic orientation of the actor's procedure to decide what is correct behaviour and choose his course of action (i.e. his strategy).

STRATEGY

An application of a particular rationality to a particular environment.

The present chapter has demarcated three basic conceptions of rationalities and strategies, which are to be considered along with the ones suggested in Exhibit 5.A. and in the various models of organisational decision-making.

In this respect, the following table provides, for each conception of organisational decision-making, a brief characterisation of the way in which the individual rationalities, the type of decision, the choice mechanism, and the organisation are formalised in the literature.

The table has two major limits. Firstly, each model or theory has its own specific structure and particular terminology. Classifying models or theories under common headings in a table supposes that the variety between, and the idiosyncracies inherent in, the diverse conceptions were somehow reduced.

Secondly, the limited number of models which were reviewed hardly enables the table to pretend to exhaustivity. However, if one excepts the Logico-Transcendentalist models[129] and those derived

from René Thom's Catastrophes Theory,[130] it seems that most of the models which do not appear in the following table can be derived from the models or theories already reviewed.

Fig.29- Aggregation of rationalities and strategies: organisational Decision - Making

Conceptual Framework	Organisation	Rationality	Choice Mechanism	Decision
Rational Actor model	Super-individual	Perfect rationalities	Maximisation	Organisational choice
Organisational model	Set of procedures	"Programmed" rationalities	Central coordination	Organisational output
Political model	Set of "rules of the game"	Competing rationalities	Domination	Organisational resultant
Simon's model	Set of specialised sub-units	Bounded rationalities	Satisficing	Minimal acceptable alternative
Coalitional model	Set of Coalitions of individuals	Partisan rationalities	Implementation of standard procedures	Sequential satisfaction
Garbage Can model	Organised anarchy	Ambiguous rationalities	Strategic agglomeration	Intersection of problems and solutions
Psychological model	Set of codes	Dependent rationalities	Decoding	Satisfaction of the libido
Cybernetic model	Network of black boxes	Co-operating rationalities	Neutral (technical) communication	Logical output
Crozier's model	Coalition of strategies	Bounded, but irreducible rationalities	Absorption-transmission of uncertainty	Exchange of uncertainty
Fuzzy models	Set of gradual preferences	Approximate rationalities	Fuzzy maximisation	Fuzzy consensus

4. Conclusion of the Fifth Chapter

This chapter has examined the concept of decision in general (Section 1), before tackling the problem of rationalities and strategies both at the individual (Section 2) and collective (Section 3) levels. The third section allowed for demarcating models or theories of practical interest to the question of the present research.

In this respect, Fig.28 and Fig.29 above aim at providing insights into previous or current researches by summarising the literature on decision-making. However, as regards the present research, it must be stressed that no assumption is made a priori about the type of decision, rationality and strategy which the empirical work will focus on. At this stage, formal rather than substantive assumptions are made about the concepts which are at the centre of the research. The key propositions are the following:

(i) Decision-making may be influenced by corporate idiosyncracies and must be related to the actors' rationalities and strategies, as elements of the organisational climate;

(ii) It seems that the study of organisational zones of uncertainty and stakes helps the researcher to understand and characterise the actors' strategies and rationalities;

(iii) The latter point tends to indicate that rationalities and strategies cannot be categorised a priori in a precise and meaningful way. It seems that they have to be assessed in the light of the organisational idiosyncratic context itself, and in the light of the actors' experience, feelings and actions, "on the ground".

Accordingly, at this stage, no substantive taxonomy of rationalities and strategies will be given. However, such a

taxonomy may be possible a posteriori. In this case, the empirical research should indicate this possibility, or suggest an impossibility. The key propositions above will appear in the form of hypotheses. This leads one to the research methodology problem, which the following chapter is aimed at solving.

THE USUAL CATEGORIES OF THE CLASSICAL THEORY OF CHOICE

The basic concepts of the theory of choice are alternative strategies, states of nature in one of which the chosen strategy will have to operate, and outcome of every possible strategy in every state of nature.

The usual categories of the theory are: uncertainty, risk, and incomplete knowledge. Accordingly, the theory distinguishes three approaches, according to the amount of information they assume to be available about the probabilities with which the states of nature are likely to occur.

The first approach assumes that the decision-maker is working in conditions of complete uncertainty about the future, i.e., that no information about the probabilities is available to him. This situation is referred to as decision-making under uncertainty.

The second approach takes the view that probabilities of the states of nature can be specified uniquely, either by repeated experimentation or by eliciting unique subjective probabilities from the decision-maker. This situation is termed decision-making under conditions of risk.

The third approach attempts to strike a balance between the above mentioned approaches. It assumes that in many decision problems some information is available about the probabilities of the states of nature, but that it is not comprehensive enough to enable exact specification of the probabilities. Decision-making in such circumstances is referred to as decision-making under conditions or incomplete knowledge.

A.2. Decision-Making Under Uncertainty

Such a situation is often postulated when investment decisions are considered. Many such decisions are unique, and past experience is of little help in trying to predict how likely are the relevant

states of nature. Several criteria have been proposed to help decision-makers facing such conditions.

A.2.1. Wald's Maximin Criterion

The maximin criterion suggests that the decision-maker should examine only the minimum payoffs of strategies and select the strategy with the largest of these. This criterion is very attractive to a cautious decision-maker who wants to ensure that even if an unfavourable state of nature occurs, there is some known minimum payoff below which he cannot fall. Such an approach may be justified because the minimum payoffs may have high probability of occurrence, although this is not known, or because realisation of a very low payoff may lead to financial disaster.

A.2.2. Maximax Criterion

The maximax criterion, on the contrary, advises the decision-maker to examine only maximum payoffs of strategies and to select the strategy with the largest of these. Maximax reflects the viewpoint of a very optimistic decision-maker who is greatly attracted by the high payoffs and hopes that the uncertain future will develop favourably for him. The criterion also appeals to a decision unit (i.e., a group of decision-makers) that is sufficiently robust to be able to cope with failure without suffering undue inconvenience.

A.2.3. Hurwicz's Criterion

This criterion attempts to strike a balance between both the above mentioned approaches. It suggests that the minimum and maximum payoffs of each strategy should be averaged using as weights a and 1-a (where a is the index of pessimism) and the strategy with the highest average selected. This index a reflects the decision-maker's attitude to risk-taking. An extremely cautious decision unit will set: a = 1, and then Hurwicz's criterion reduces to the maximin criterion. Conversely, an extremely optimistic decision unit will set: a = 0 (maximax criterion).

A.2.4. Savage's Minimax Regret Criterion

The Savagian criterion looks at the regret, opportunity cost or loss which arises when a particular state of nature is assumed to have occurred and the payoff of the selected strategy is smaller than the maximum payoff which could have been attained for that state of nature. The criterion suggests that the decision-maker should look at the maximum regret of each strategy and select the one with the smallest of these. The criterion takes the viewpoint of a cautious decision-maker who wants to ensure that the selected strategy does well in comparison with other strategies irrespective of which state of nature happens to arise. Such a situation often arises when several decision-makers are in competition and whose performance is evaluated not in isolation but in relation to the others. It has been noticed that the Savagian rationality often constitutes the rationality of the business consultant: his recommendations are judged a posteriori, and his goal is to minimise his client's hypothetical regret to have resorted to him rather than to other consultants.

A.2.5. Bayes-Laplace's Criterion

This criterion employs the principle of insufficient reason which postulates that if no information is available about the probabilities of the states of nature, it is only reasonable to assume that they are equally likely. Accordingly, the decision-maker should calculate the expected payoff for each strategy and select the one with the highest of these. The use of expected values distinguishes this criterion from the other complete ignorance criteria which utilise only extreme payoffs of strategies.

A.3. Decision-Making Under Risk

In this situation it is assumed that exact probabilities of the states of nature are available. Sometimes, the probabilities can

be established experimentally or deduced from a priori considerations; on other occasions, the decision-maker's subjective probabilities are used. In the latter case, the probabilities are based on the decision-maker's beliefs about the future, and are obtained from him directly or indirectly in a number of ways. This is invariably the case with decision-making in business where experimentation is not possible. Once the probabilities of the states of nature are established, the expected payoffs for strategies are calculated. The strategy which will be accepted, according to the maximum expected value criterion is the one which, in the long run, gives rise to the most attractive outcomes.

A.4. Decision-Making Under Incomplete Knowledge

This approach considers that both the theoretical extremes of decision-making under risk and decision-making under uncertainty are unrealistic in their assumptions concerning what is known about the probabilities of the states of nature. It is assumed that there are many circumstances in which the amount of information available to a decision unit does not permit the precise specification of the probabilities of future states of nature, but where the assumption of complete ignorance conditions is unreasonable. The approach suggests that a very effective way of formally characterising the existence of incomplete knowledge of probabilities of states of nature is to assume that the decision-maker is able to specify a ranking of the probabilities. From both a strict and a weak ranking of probabilities of states of nature, maximum and minimum expected values of the payoffs of strategies are derived.

For further information on decision-making under conditions of incomplete knowledge, it may be referred to Kmietowicz and Pearman, on whom this summary draws heavily.[131]

CHAPTER V

NOTES AND REFERENCES

1- Ghertman, M. La prise de decision. Paris, P.U.F., 1981, pp.5-10.

2- McGrew, A.G., & M.J. Wilson (Editors). Decision-making: approaches and analysis. Manchester, Manchester University Press, 1982, pp.4 and 13.

3- Simon, H. The new science of management decision. New York, Harper and Row, 1960.

4- Kolb, D. On management and the learning process. In Organisational psychology, edited by D. Kolb, I. Rubin, & J. Intyre. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1974.

5- March, J.G., & J.P. Olsen. Ambiguity and choice in organisations. Oslo, Universitetsforlaget, 1976, pp.12-19.

6- Ibid., p.18

7- Ibid.

8- Ibid.

9- Axinn, S. The logic of degree of rationality. Proceedings of the 6th Congress on Cybernetics. Namure, Belgium, 1971, pp.1269-1276. See p.1269.

10- See: Carley, M. Rational techniques in policy. London, Heinemann Educational Books, 1981.

11- Brubaker, R. The limits of rationality. London, George Allen & Unwin, 1984, p.1.

12- Ibid., p.2.

13- Weber, M. Economy and society. Edited by G. Roth & C. Wittich. Berkeley, University of California Press, 1978, pp.635-636.

14- See: Weber, M. The protestant ethic and the spirit of capitalism. Translated by T. Parsons. New York, Scribner's , 1958, p.194., n.9.

15- See: Weber, M. Economy and society. Op.cit., pp.65-67.

16- Weber, M. Selections in translations. Edited by W.G. Runciman, translated by E. Matthews. Cambridge, Mass., Cambridge University Press, 1978, p.338.

17- See: Weber, M. Economy and society. Op.cit., p.24.

18- Ibid., p.811.

19- Ibid., p.1394.

20- Ibid., pp. 225 and 959.

21- Marcuse, H. Industrialisation and capitalism. In Max Weber and sociology today, edited by O. Stammer. New York, Harper and Row, 1971, pp.133-151.

22- See: Weber, M. Economy and society. Op.cit., pp.998 and 1156.

23- See: Weber, M. The protestant ethic and the spirit of capitalism. Op.cit., p.117.

24- Allison, G.T. Essence of Decision. Op. cit., p. 71.

25- See: March, J.G., & H.A. Simon. Organisations. New York, John Wiley, 1958, pp.137 et sq.

26- Ibid., p.138.

27- See: Tinbergen, J. Economic policy: principles and design. Amsterdam, North Holland Publishing Company, 1956.

28- See: Dimock, M. A philosophy of administration. New York, Harper, 1958.

29- See: Jabes, J. Individual decision-making. In Decision-making: approaches and analysis. Op.cit., pp.53-59.

30- For instance, see: Simon, H.A. Administrative behaviour. New York, Macmillan, 1947.

31- Simon, H.A. Models of man. New York, Wiley, 1957.

32- Soelberg, P. Unprogrammed decision-making: Papers and Procedings, 26th Annual Meeting. Academy of Management, December 1966, pp.27-29.

33- These five clusters are summed up in Allison's Essence of decision, op.cit., pp. 71-72.

34- Jabes, J. Op.cit., p.57.

35- See: Simon, H.A. From substantive to procedurial analysis. In Method and appraisal in economics, edited by S.J. Latsis. Cambridge, Cambridge University Press, 1976, pp.129-149.

36- Rawls, J. A theory of justice. Oxford, Clarendon Press, 1972.

37- Richardson, J.J., & A.G. Jordan. Governing under pressure. London, Martin Robertson & Co. Ltd., 1979.

38- Descartes, R. Discours de la methode pour bien conduire sa raison. Paris, Union Generale d'Edition, 1951. (modern edition)

39- Bertalanffy, von, L. Problems of general system theory. Human Biology, vol.23, 1951, pp.302-312.

40- Ashby, W.R. An introduction to cybernetics. New York, Sciences Editions, 1966.

41- Forrester, J. Principles of systems. Cambridge, Wright Allen Press, 1969.

42- Le Moigne, J.-L. La theorie du systeme general. Paris, P.U.F., 1977, pp.13-23.

43- Descartes, R. A discourse on method: method of right conducting the reason... Translated from the French by J. Veitch. London, J.M. Dent and Sons, Ltd., 1957, p.15.

44- Le Moigne, J.-L. Op.cit., p.23.

45- Descartes, R. A discourse on method.. Op.cit., p.15.

46- See:

- Le Moigne, J.-L. Op.cit., p.23.

- Ackoff, R.L., & F.E. Emery. On purposeful systems. London, Tavistock, 1972, p.41.

47- See: Descartes, R. A discourse on method.. Op.cit., p.16.

48- See, particularly:

- Greene, de, K. Sociotechnical systems: factor analysis, design and management. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1973, p.93.

- Churchman, C.W. Design of enquiring systems, basic concepts of systems and organisation. New York, Basic Books, 1971, p.45.

- Ackoff, R.L. Redesigning the future: a systems approach to societal problems. New York, John Wiley, 1974, p.16.

49- See: Le Moigne, J.-L. Op.cit., p.23.

50- Descartes, R. A discourse on method.. Op.cit., p.16.

51- See:

- Le Moigne.J.-L. Op.cit., p.23.

- Zadeh, L.A. & E. Polak. System theory. New York, McGraw-Hill, Inc., 1969, p.4.

52- Axinn, S. The logic of degree of rationality. Op.cit., p.1271.

53- Ibid., p.1272.

54- See: March, J.G., & J.P. Olsen. Organisational choice under ambiguity. In Ambiguity and choice in organisations. Op.cit., pp. 15-16.

55- Rousseau's General Will stands as a metaphysical entity representing an integration of the individual wills.
See: Rousseau, J.-J. Du contrat social. Paris, Union Generale d'Edition, 1973. (modern edition)

Kant's Categorical Imperative aims at furnishing an a priori moral law able to unify human behaviours. The transition from individual to collective decisions is legitimated by the validity of the transition from particular to universal ethics, since this

Imperative may be summarised as follows: "Act in a way such that the maxim of your action might stand as a universal rule (law)."
See: Kant, I. Critique of practical reason. London-New York, Garland, 1976. (modern edition)

Bentham thought that the way to discover moral principles was to consider what could be consistently recommended to people, taking people as they are; the "Felicific Calculus" aims at providing the "greatest welfare to the greatest number."

56- Mcgrew, A.G., & M.J. Wilson. Op.cit., p.3.

57- Allison, G.T. Op.cit., pp.2-5.

58- Crozier, M., & E. Friedberg. L'acteur et le systeme. Op.cit.

59- Mohr, L.B. Organisations, decisions and courts. Law and Society Review, vol.10, 1976, pp.621-642.

60- Ghertman, M. La prise de decision. Op.cit.

61- Belkaoui, A. Standard setting for oil and gas accounting: an analysis using Allison's approach. Accounting and Finance, vol.23 (1), May 1983, pp.64-73.

62- See:

- Howard, R.A., J.E. Matheson, & K.L. Miller. Reading in decision analysis. Menlo Park, Cal., Stanford Research Institute, Decision Analysis Group, 1976.

- Kaplan, M.F., & S. Schwartz. Human judgment and decision processes in applied settings. New York, Academic Press, Inc.,1977.

63- See:

- Mobley, W.H., & B.M. Meglino. A behavioural choice model analysis of the budget allocation behaviour of academic deans. Academy of Management Journal, vol.20, 1977, pp.564-572.

- Keen, P.G.W., & M.S.S. Morton. Decision support systems: an organisational perspective. Reading, Mass., Addison-Wesley Publishing Company, 1978.

64- See: Allison, G.T. Op.cit., p.72.

65- See Chapter V, 2.1.1.

66- See Chapter II, 2.3.2.1.

67- See:

- Henderson, J.M., & R.E. Quandt. Microeconomics theory: a mathematical approach. New York, McGraw-Hill, 1958.

- Vickers, D. The theory of the firm: production, capital and finance. New York, McGraw-Hill, 1968.

68- From McGrew, A.G., and M.J. Wilson. Op.cit., p.8.

69- Allison, G.T. Op.cit., p.5.

70- Cyert, R.M., & J.G. March. A behavioural theory of the firm. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963, pp.5-8.

71- McGrew, A.G., & M.J. Wilson. Op.cit., p.8.

72- See: Allison, G.T. Op.cit., pp.67-100.

73- See: McGrew, A.G., & M.J. Wilson. Op.cit., p.9.

74- See: Allison, G.T. Op.cit., pp. 144-184.

75- See: McGrew, A.G., & M.J. Wilson. Op.cit., p.10.

76- See: Simon, H.A. Models of man. New York, Wiley, 1957, pp. 263 et sq.

77- Ibid., pp.204 et sq.

78- A summary of these five simplifications appears in: Allison, G.T. Op.cit., pp.71-72.

79- See: Simon, H.A. Administrative behaviour (second edition). New York, Macmillan Company, 1957, p.96.

80- Ibid.,p. 97.

81- Ibid.

82- Ibid., p.98.

83- Ibid., p.99.

84- Ibid.

85- Ibid., p.100.

86- Ibid., p.101.

87- Ibid., pp.123-153.

88- Simon, H.A. The new science of management decision. Englewood Cliffs, N.J., Prentice-Hall, 1977, p.114.

89- See: Cyert, R.M., & J.G. March. A behavioural theory of the firm. Op.cit., p.112.

90- Ibid., p.126.

91- Ansoff, H.I. Corporate strategy. New York, McGraw-Hill, 1965, pp.5-20.

92- See: March, J.G., & J.P. Olsen. Ambiguity and choice in organisations. Op.cit., pp.19-20.

93- Ibid., p.19.

94- Ibid., p.12.

95- See: Cohen, M.D., J.G. March, & J.P. Olsen. People, problems, solutions, and the ambiguity of relevance. In Ambiguity and choice in organisations. Op.cit., pp.24-37, pp.28-29.

96- Ibid., p.32.

97- See: Cohen, M.D., & J.G. March. Leadership and ambiguity: the American College president. New York, McGraw-Hill, 1974, p.81.

98- See: March, J.G. The technology of foolishness. In Ambiguity and choice in organisations. Op.cit., pp.69-81, p.70.

99- Ibid., p.80.

100- See: March, J.G., & J.P. Olsen. Ambiguity and choice in organisations. op.cit., p.11.

101- Sfez, L. Critique de la decision. Paris, Armand Colin, 1973.

102- Ibid., p.342.

103- See, for example:

- Foucault, M. Histoire de la sexualite, tome I: la volonte de savoir. Paris, Gallimard, 1976, pp.196-198 and 208-211.

104- See: Wiener, N. The human use of human beings: cybernetics and society (Fourth edition). New York, Avon Books, 1970, p.25.

105- See: Appel, P. Discours et realites de la decision dans l'entreprise. Revue Francaise de Gestion. January-February 1977, pp.11-20.

106- Ibid., p14.

107- Ibid., pp.16-17.

108- See: Crozier, M. (with E. Friedberg). L'acteur et le systeme. Op.cit.

109- Zadeh, L.A. Fuzzy sets. Information and Control, vol.8, 1965, pp.338-353.

110- Zadeh, L.A. In Fuzzy sets: theory and applications to policy analysis and information systems, edited by P.P. Wang & S.K. Chang. New york, Plenum Press, 1980, p. vi.

111- Bellman, R.E., & L.A. Zadeh. Decision-making in a fuzzy enviromment. Management Science, vol.17, pp. 141-164.

112- Luce, R.D., & H. Raiffa. Games and decisions. New York, John Wiley and Sons, Inc., 1957.

113- Savage, L.J. The foundations of statistics. New York, John Wiley and Sons, Inc., 1954.

114- Finetti, de, B. Probability, induction, and statistics: the art of guessing. New York, John Wiley and Sons, Inc., 1972.

115- Blin, J.M., & Whinston. Fuzzy sets and social choice. Journal of Cybernetics, vol.4, 1974, pp.3-28.

116- Ragade, R.K. Fuzzy sets in communication systems and in consensus formation systems. Journal of Cybernetics, vol.6, 1976,

pp.21-38.

117- See:

- Spillman, B., J. Bezdek, & R. Spillman. A study of coalition formation in decision-making groups: an application of fuzzy mathematics. Kybernetes, vol.8, 1979, pp.203-211.

- Spillman, B., Spillman, R., & J. Bezdek. A fuzzy analysis of consensus in small groups. In Fuzzy sets: theory and applications to policy analysis and information systems, edited by P.P. Wang & S.K. Chang. New York, Plenum Press, 1980, pp. 291-308.

118- See: Asai, K, H. Tanaka, & T. Okuda. Decision-making and its goal in a fuzzy environment. In Fuzzy sets and their applications to cognitive and decision processes, edited by L.A. Zadeh, K.-S. Fu, K. Tanaka, & M. Shimura. New York, Academic Press, Inc., 1975, pp. 257-277.

119- Yager, R.R. Satisfaction and fuzzy decision functions. In Fuzzy sets: theory and applications to policy analysis and information systems. Op.cit., pp.171-194. See p.171.

120- Zadeh, L.A. Calculus of fuzzy restrictions. In Fuzzy sets and their applications to cognitive and decision processes. Op.cit., pp.1-39. See p.1

121- Ibid., p.2.

122- Ibid.

123- Fung, L.W., & K.-S. Fu. An axiomatic approach to rational decision-making in a fuzzy environment. In Fuzzy sets and their applications to cognitive and decision processes. Op.cit., pp.227-256.

124- Barnard, C.I. The functions of the executive. Cambridge, Mass., Harvard University Press, 1938, p.195.

125- Huber, G.P. Organisational science contributions to the design of decision support systems. In Decision support systems: issues and challenges, edited by G. Fick & R.H. Sprague, Jr. Oxford, Pergamon Press Ltd, 1980, pp.45-55. See: p.46.

126- See: Weiss, C.H. Knowledge creep and decision accretion. Social science research and decision-making. New York, Columbia University Press, 1980.

127- See: Huber, G.P. Op.cit., p.50.

128- The virtual environment may consist, for example, of the firm's market shares in five years, of the competitors' behaviours within the future decade, etc.

129- Logico-Transcendentalist models are based on Kurt Gödel's works on completness and consistency in arithmetical and logical systems. Basicaly, these models consider that any human collectivity cannot "enjoy completness" without resorting to "something" outside the collectivity. Decisions can be viewed as the human collectivity's attempts to reach completness while trying to preserve consistency. See:

- Gödel, K. On completness and consistency. In Two fundamental texts in mathematical logic, edited by Van Heijenoort. Cambridge, Mass., Harvard University Press, 1970. (Initially published in Germany, in 1931, in the form of articles)

130- The Catastrophes Theory is based on René Thom's research in mathematics, physics and morpho-genesis in general. As far as the study of decision-making is concerned, the models derived from this theory still need some elaboration and test. Basically, decisions are viewed as catastrophic phenomena, and the point is to study the genesis of the passage from equilibrium neighbourhood to catastrophe neighbourhood through a series of identifiable states of the system. See:

- Thom, R. Structural stability and morphogenesis: an outline of a general theory of models. Translated from the French by D.H. Fowler. Reading, Mass., W.A. Benjamin, Inc., 1975.

131- Kmietowicz, Z.W., & A.D. Pearman. Decision theory and incomplete knowledge. Aldershot, Hampshire, Gower Publishing Company, Ltd, 1981.